M770E, M770EL

Elliptical CrossTrainer

SERVICE MANUAL

This service manual is for use by Motus trained service providers only.

If you are not a Motus Trained Servicer, you must not attempt to service any Motus product.

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SECTION I

TROUBLESHOOTING GUIDE

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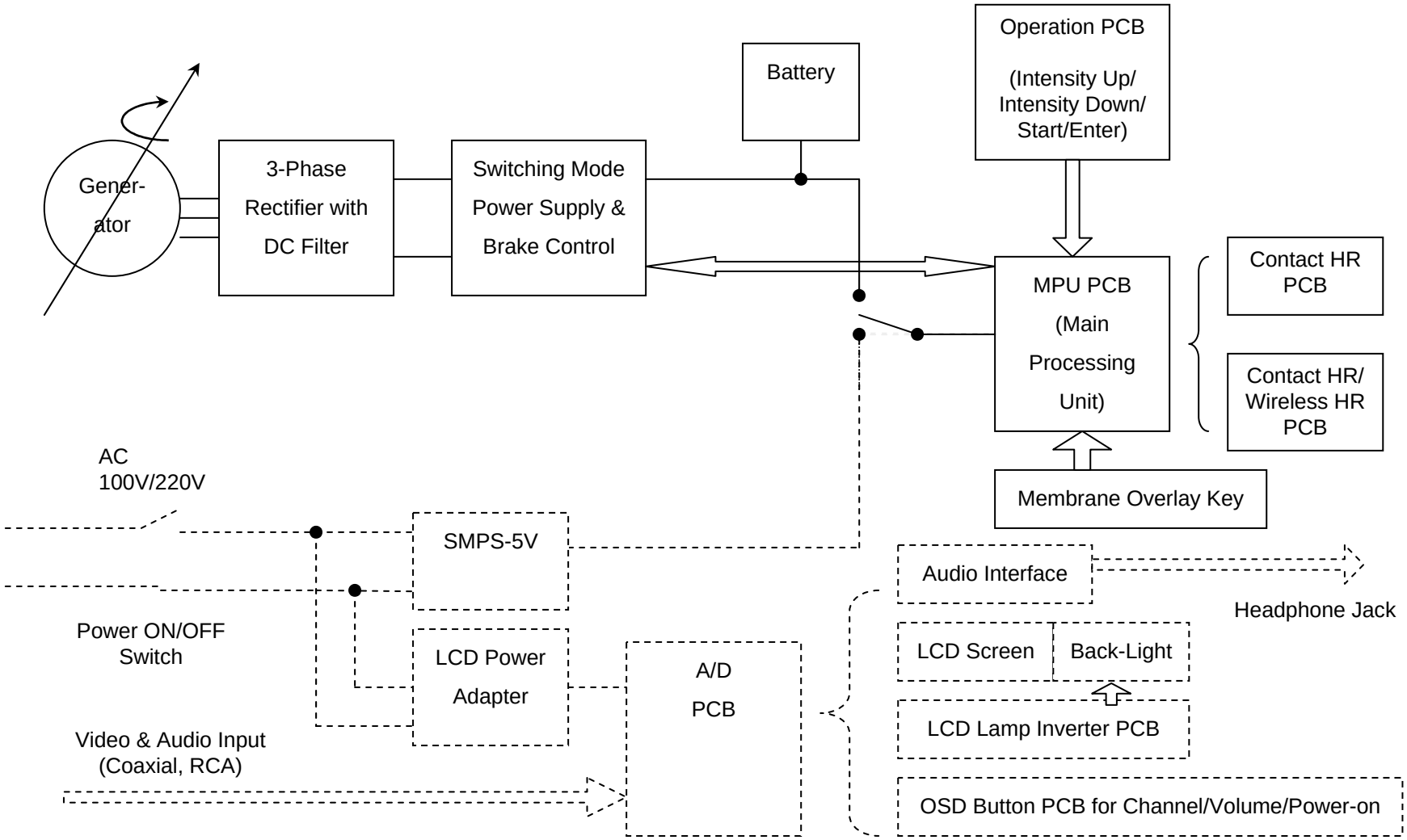
1.1 System Block Diagram

Note: Dotted line is applied to M770EL/M770E



1.2 Troubleshooting Guide

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION	
No power to Console (On M770EL)	Line voltage is not present at equipment.	Check the main circuit breaker and wall outlet voltage at the Facility. If wall outlet voltage is present, then replace line cord.	
	Power-on Switch is damaged.	Replace Power-on Switch if the output voltage of Power Switch is not present.	
LCD TV is normal, but Dot-LED and Numeric LED do not light up (On M770EL)	Defective SMPS-5V (MPU Power Supply)	Measure the voltage between pin 1 and pin 4 on CN2.	If no voltage, replace Defective SMPS-5V (MPU Power Supply).
	Defective Wire Harness		If no voltage, verify that CBB3 interconnected with CBB4 cable is plugged into both MPU Board and SMPS-5V. Replace if necessary.
	Defective MPU Board		If no voltage, replace MPU PCB.
Dot-LED and Numeric LED are normal, but LCD TV does not light up or is blank	Refer to 1.3 Troubleshooting Guide for LCD.	Refer to 1.3 Troubleshooting Guide for LCD.	
Console LEDs are not illuminating (On M770E)	Faulty MPU board or Drive board	Using a Multi-meter, verify more than 6VDC at pin-7 and pin-8 on CN1. If voltage is present, replace MPU board. If not, replace Drive board.	
		Test with substitute MPU board or Drive board. Replace if necessary.	
	Cable connection or loose wire connection	Verify that main cable CN1 is securely plugged into both MPU board and Drive board. Replace if necessary.	
	Worn or damaged wire harness	Inspect wire harness. Replace worn or damaged harness.	

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Dot-LED or Numeric LED lights up and then fails. (On M770E)	Faulty Battery, Note: Battery is used only for M770E, self-powered model.	Verify that Battery voltage is greater than 6 volts DC. Replace Battery if the voltage is lower than 6 volts DC.
	Faulty MPU board or Drive board	Test with substitute MPU board. Replace if necessary.
		Test with substitute Drive board. Replace if necessary.
	Cable connection or loose wire connection	Verify that main cable CN1 is plugged into both MPU board and Drive board. Replace if necessary.
	Worn or damaged wire harness	Inspect wire harness. Replace worn or damaged harness.
Unit does not Auto Start (On M770E)	Faulty Battery	Verify that Battery voltage is greater than 6 volts DC. Replace Battery if the voltage is lower than 6 volts DC.
	Cable connection	Verify that the cable connection at MPU board and Drive board or the connection between cables at midpoint is plugged in properly. Using a Multi-meter, verify continuity on all cables. Replace any defective cables.
	Faulty Drive board	If cable connection is verified as good, replace the Drive board.
Unit does not display SPEED on Console	Cable connection	Verify that the cable connection at MPU board and Drive board or the connection between cables at midpoint is plugged in properly. Using a Multi-meter, verify continuity on all cables. Replace any defective cables.
During exercise program, pedaling is insufficiently easy without providing adequate resistance.	Program intensity doesn't challenge user ability.	Select higher workout intensity.
	Drive Belt is worn	Replace Belt.
	Drive Belt is excessively loose	Inspect Belt tension. Adjust if necessary.
	Cable connection or loose wire connection	Verify that the cable connection at MPU board and Drive board or the connection between cables at midpoint is securely plugged in properly. Using a Multi-meter, verify continuity on all cables. Replace any defective cables.
	Worn or damaged wire harness	Inspect wire harness. Replace worn or damaged harness.
	Faulty Button Switch or Operation Button board	Verify that workout intensity on Console is increased or decreased by pressing UP/DOWN button switch. Replace Button Switch or Operation Button board if there is no change on intensity profile.
	Defective MPU board or Defective Drive board	Test with substitute MPU board or Drive board. Replace if necessary.

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Display Console Keys do not function and unit does not respond.	Malfunction Overlay, Button Switch or Operation Button board	Replace Overlay, Button Switch or Operation Button board.
	Defective MPU board	Test with substitute MPU board. Replace if necessary.
During MANUAL program, excessive resistance loading occurs.	Defective MPU board	Test with substitute MPU board. Replace if necessary.
	Defective Drive board	Test with substitute Drive board. Replace if necessary.
	Worn or damaged wire harness	Inspect wire harness. Replace worn or damaged harness.
During MANUAL program, resistance variance occurs	Pedaling is too slow	Pedal faster.
During exercise program, loud noise issuing from unit	Loose hardware	Verify that unit is level on the floor. Verify that all hardware has been tightened. Apply Loctite where necessary.
	Worn bearings	Replace bearings and associated shaft.
	Drive Belt is too loose	Inspect Belt. Replace Belt if necessary.

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Heart rate reading is abnormally high or is displayed even when Chest Strap or Contact Heart Rate sensors are not in use.	Electromagnetic interference from television sets, cell phones, refrigerator, or motor driven exercise equipment.	Keep the treadmill away from the probable cause until the heart rate readings are accurate.
	RF energy source from another chest straps.	Keep another chest strap away more than 1 meter until the heart rate readings are accurate.
	Contact Heart Rate cables are pinched at handle bars.	Replace damaged cables.
Heart rate reading using wireless chest strap is erratic or not displayed	Chest strap electrodes are not wet enough to sense accurate heart rate.	Dampen the Chest strap electrodes with tap waters.
	The distance between cardio equipments are too close.	Maintain the distance more than 30 cm.
	Chest strap electrodes are out of monitoring range.	Make sure the chest strap is within 60cm from Wireless HR PCB.
	Chest strap battery is discharged.	Replace chest strap or the battery.
	Chest strap electrodes are not laid flat or horizontally across your skin.	Make sure the chest strap electrodes lies flat and horizontally across your skin.
	Faulty chest strap.	Replace chest strap.
	Faulty Wireless HR PCB.	Replace Wireless HR PCB.
	Defective cable or bad connection between Wireless HR PCB and MPU PCB.	Check the cable and connection is no problem.
Contact Heart Rate reading is erratic or not displayed.	Faulty CHR PCB.	Replace CHR PCB
	Dirty handlebar sensors.	Wipe stainless steel sensors with a clean soft cloth.
	Defective cable or bad connection between CHR PCB and MPU PCB.	Check the cable and connection is no problem
	User may have an unusual heart rate condition.	Let different user grasp sensors to detect any variances.

1.3 Troubleshooting Guide for LCD

Symptom/Condition		PROBABLE CAUSE	**CORRECTIVE ACTION**
Snow and noise are scattering on LCD screen. Any picture is not found even though channel-up button or channel-down button is pressed.		Air/cable setting is not correct	Follow the set up procedures in LCD manual.
		TV signal source is not supplied.	- Check if the TV signal source is correctly supplied to A/D PCB from external source. - Make sure the cable is properly secure. - If external TV signal is correct, try to connect the coaxial cable directly to the internal connector in AD PCB of Console to check whether the internal cables are wrong or not.
		75 ohm coaxial cable is bad.	Replace 75 ohm coaxial cable.
		A/D Board is damaged.	Replace A/D Board with new one.
LCD screen is uniformly white		Internal cable connection is loose or disconnected.	Check if the connection between LCD screen and A/D Board is tight. In other word, LVDS cable shown in picture.
Vertical large white-stripe or Vertical stripe block on LCD screen		Problem with LCD screen	Replace LCD screen
LCD screen is dark or black.	When LCD power is turned on by pressing TV on/off, "**VIDEO**", "**S-VIDEO**" or "**ANALOG**" appears temporarily and then disappears on the left upper corner of LCD screen.	TV mode is not set-up.	1) Whenever you press Volume down button, words are displayed in following order on the left upper corner of LCD screen. **"ANALOG"=>"VIDEO"=>"S-VIDEO"=>"TV"** 2) Press the button until "**TV**" is displayed. 3) As soon as "**TV**" is displayed, snow and noise will be scattering on LCD screen or any picture will be captured.
	When LCD power is turned on by pressing TV on/off, "**VIDEO**", "**S-VIDEO**" or "**ANALOG**" is **NOT** displayed on the	LCD Power Supply has a problem. Power Supply is used for supplying 12 VDC	Check if LCD Power supply is normally operated or LED lamp on Power supply body is turned on. If LED is off,

	left upper corner of LCD screen.	to LCD Overlay Bezel Assembly.	● replace Power Adapter. If LED is on, ● tighten midpoint (LCD Power Supply side) & endpoint (A/D Board side) connection. ● or make sure the voltage of end point is DC 12 volt.
		The cable related to LCD Lamp Inverter is loose in either side.	Check if the connection is secure.
		TV on/off button is wrong or stuck.	Replace OSD Button Board.
		A/D Board is damaged.	Replace A/D Board.
		LCD Lamp inverter is damaged.	Replace LCD Lamp inverter.
		LCD Back Light is damaged.	Replace LCD screen.
		The connector or cable is bad.	Replace the connector or cable
Channels or Volume does not change		Button to change channels or volume does not work.	Replace the button, OSD Button Board or harness related to it.
No sound		Air/cable setting is not correct	Follow the set up procedures in LCD manual.
		Faulty headphones	Replace headphones
		Faulty headphone jack assembly or Audio Interface Board.	Replace Audio Interface Board or headphone jack.

SECTION II

HOW TO REPLACE & REPAIR GUIDE

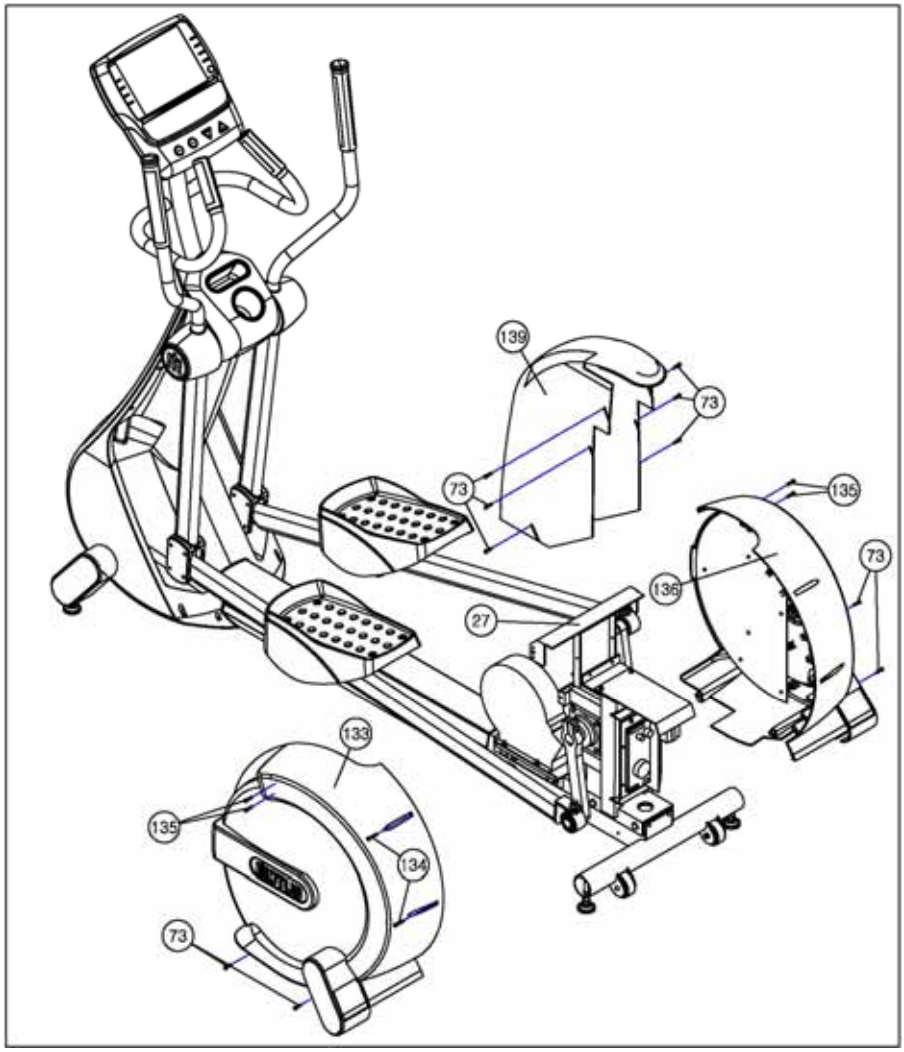
General

2.1 How to Replace the REAR COVER
2.2 How to Adjust the Drive Belt (or Pulley Belt) Tension
2.3 How to Replace the Drive Belt (or Pulley Belt)
2.4 How to Replace the Generator
2.5 How to Replace the UNIT BEARING – UCF206
2.6 How to Replace the CRANK ASSEMBLY
2.7 How to Disassemble the PEDAL BASE, LOW JOINT CAP or HANDLE PIVOT JOINT CAP
2.8 How to Replace the NEEDLE BEARINGS inside the PEDAL COUPLER
2.9 How to Replace the OILLESS BUSH inside the COUPLER FRAME
2.10 How to Replace the PEDAL SHAFT
2.11 How to Replace the HANDLE CRANK FRAME
2.12 How to Replace the Heart Rate SENSORS

2.1 How to Replace the REAR COVER

The procedures to replace the REAR COVER are commonly applied when the replacements below are done.

- How to Adjust the Drive Belt Tension
- How to Replace the Drive Belt
- How to Replace the Unit Bearing-UCF206
- How to Replace the Drive PCB
- How to Replace the Battery
- How to Replace the Generator
- How to Replace the Crank Assembly



1) The following tools are required.

Philips Screw Driver, Wrench Sets, Snap Ring Pliers

2) Remove two BUTTON CROSS BOLT (134) securing left REAR COVER-L (133) to right REAR COVER-R (136).

3) Remove two BUTTON CROSS BOLT (73) and two ALLEN BOLT (135) securing left REAR COVER-L (133) to the Frame, and then remove left REAR COVER-L (133).

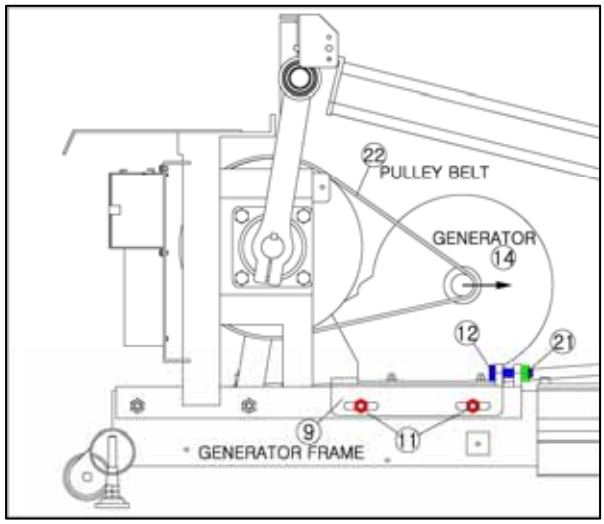
4) Remove two BUTTON CROSS BOLT (73) and two ALLEN BOLT (135) securing right REAR COVER-R (136) to the Frame, and then remove right REAR COVER-R (136).

5) Remove six BUTTON CROSS BOLT (73) and then lift REAR COVER-C (139) up.

6) Replace the specific part while referring to “How to …” if required.

7) Install the REAR COVER-C, REAR COVER-R and REAR COVER-L in reverse order.

2.2 How to Adjust the Drive Belt (or Pulley Belt) Tension

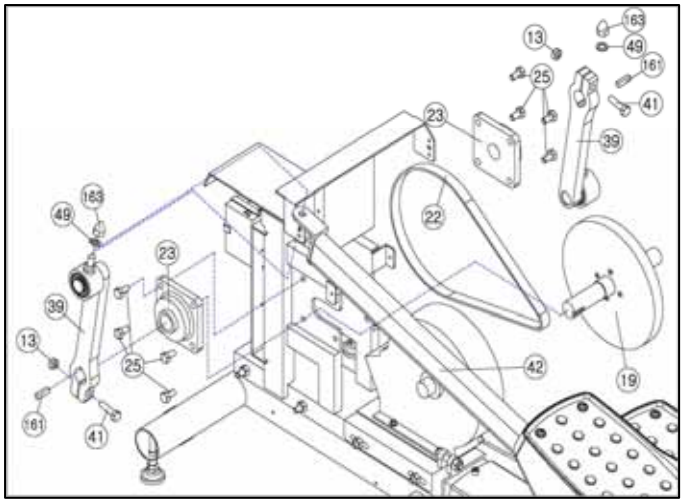


1) Loosen two HEX LOCK NUTs (11) a little using 17mm spanner.

2) To increase the tension, turn HEX NUT (21) clockwise with a 19mm spanner while holding H/S HEX BOLT (12) with another 19mm spanner. Initial tension is set to 190 Hz. To decrease the tension, turn HEX NUT (21) counterclockwise.

3) Make sure that PULLEY BELT does not slip and then install the REAR COVER-C, REAR COVER-R and REAR COVER-L in reverse order.

2.3 How to Replace the Drive Belt (or Pulley Belt)



1) Loosen two HEX LOCK NUTs (11) a little using 17mm spanner.

2) To loosen the PULLEY BELT (22), turn HEX NUT (21) counterclockwise with a 19mm spanner while holding H/S HEX BOLT (12) with another 19mm spanner. See “2.2 How to Adjust the Drive Belt (or Pulley Belt) Tension”

3) Derail the slackened PULLEY BELT (22) from the PULLEY (19).

4) Remove CAP HEX NUT (163) and PLANE WASHER (49) using 24 mm spanner.

5) Pull COUPLER FRAME (42) out of CRANK ASS’Y-230 (39) by lifting it off.

6) Remove H/S HEX BOLT (41) and HEX LOCK NUT (13) using 21 mm Spanner and then slide CRANK ASS’Y-230 (39) off the Shaft of the Pulley (19).

7) Remove SQUARE KEY (161) from the Shaft.

8) Remove four H/S HEX BOLTs (25) using 17 mm spanner and then slide the BEARING-UCF206 (23) off the Frame and Shaft of the Pulley (19).

9) To remove the CRANK ASS’Y-230 and BEARING-UCF206 in opposite side, repeat the same

procedures as 4) thru 8).

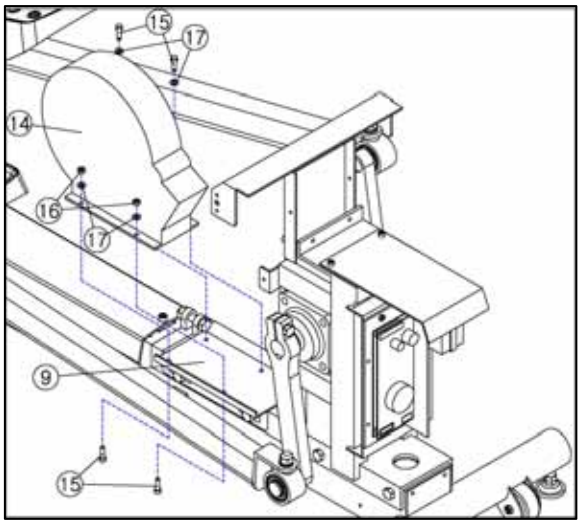
10) Remove the PULLEY (19) combined with the Shaft by taking it out toward the front of the Machine.

11) Remove the PULLEY BELT (22).

12) Install the new PULLETY BELT (22) in reverse order.

13) If needed, adjust the Pulley Belt Tension. See “2.2 How to Adjust the Drive Belt (or Pulley Belt) Tension”

2.4 How to Replace the Generator



1) Disconnect two cables from the GENERATOR.

2) Loosen two HEX LOCK NUTs (11) a little using 17mm spanner. See “2.3 How to Replace the Drive Belt”

3) To loosen the PULLEY BELT (22), turn HEX NUT (21) counterclockwise with a 19mm spanner while holding H/S HEX BOLT (12) with another 19mm spanner. See “2.3 How to Replace the Drive Belt”

4) Derail the slackened PULLEY BELT (22) from the PULLEY (19). See “2.3 How to Replace the Drive Belt”

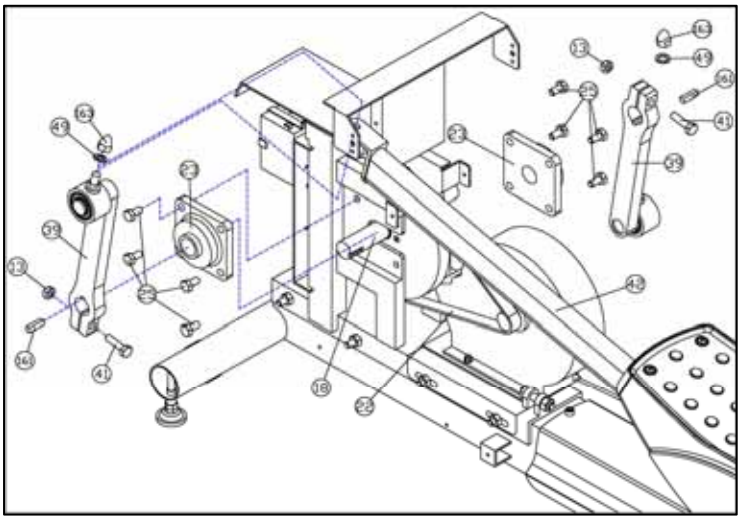
5) Remove ALLEN BOLT (15), HEX LOCK NUT (16) and PLANE WASHER (17) securing the GENERATOR (14) to the GENERATOR FRAME (9) by using 4mm wrench and 10 mm spanner.

6) Remove the GENERATOR (14) from the GENERATOR FRAME (9).

7) Install new the GENERATOR (14) in reverse order.

8) If needed, adjust the Pulley Belt Tension. See “2.2 How to Adjust the Drive Belt (or Pulley Belt) Tension”

2.5 How to Replace the UNIT BEARING – UCF206



The procedure to replace the Bearing is same on both right side and left side.

1) Loosen two HEX LOCK NUTs (11) a little using 17mm spanner.

2) To loosen the PULLEY BELT (22), turn HEX NUT (21) counterclockwise with a 19mm spanner while holding H/S HEX BOLT (12) with another 19mm spanner.

3) Derail the slackened PULLEY BELT (22) from the PULLEY (19).

4) Remove CAP HEX NUT (163) and PLANE WASHER (49) using 24 mm spanner.

5) Pull COUPLER FRAME (42) out of CRANK ASS'Y-230 (39) by lifting it off.

6) Remove H/S HEX BOLT (41) and HEX LOCK NUT (13) using 21 mm spanner and then slide CRANK ASS'Y-230 (39) off the Shaft (18) of the Pulley (19).

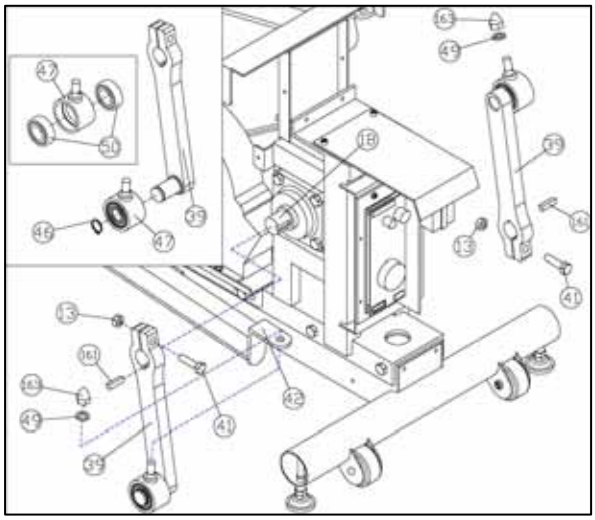
7) Remove SQUARE KEY (161) from the Shaft.

8) Remove four H/S HEX BOLTs (25) using 17 mm spanner and then slide the BEARING-UCF206 (23) off the SHAFT ASS'Y(18).

9) Install new BEARING-UCF206 (23) in reverse order.

10) If needed, adjust the Pulley Belt Tension. See "2.2 How to Adjust the Drive Belt (or Pulley Belt) Tension"

2.6 How to Replace the CRANK ASSEMBLY



1) Loosen two HEX LOCK NUTs (11) a little using 17mm spanner.

2) To loosen the PULLEY BELT (22), turn HEX NUT (21) counterclockwise with a 19mm spanner while holding H/S HEX BOLT (12) with another 19mm spanner.

3) Derail the slackened PULLEY BELT (22) from the PULLEY (19).

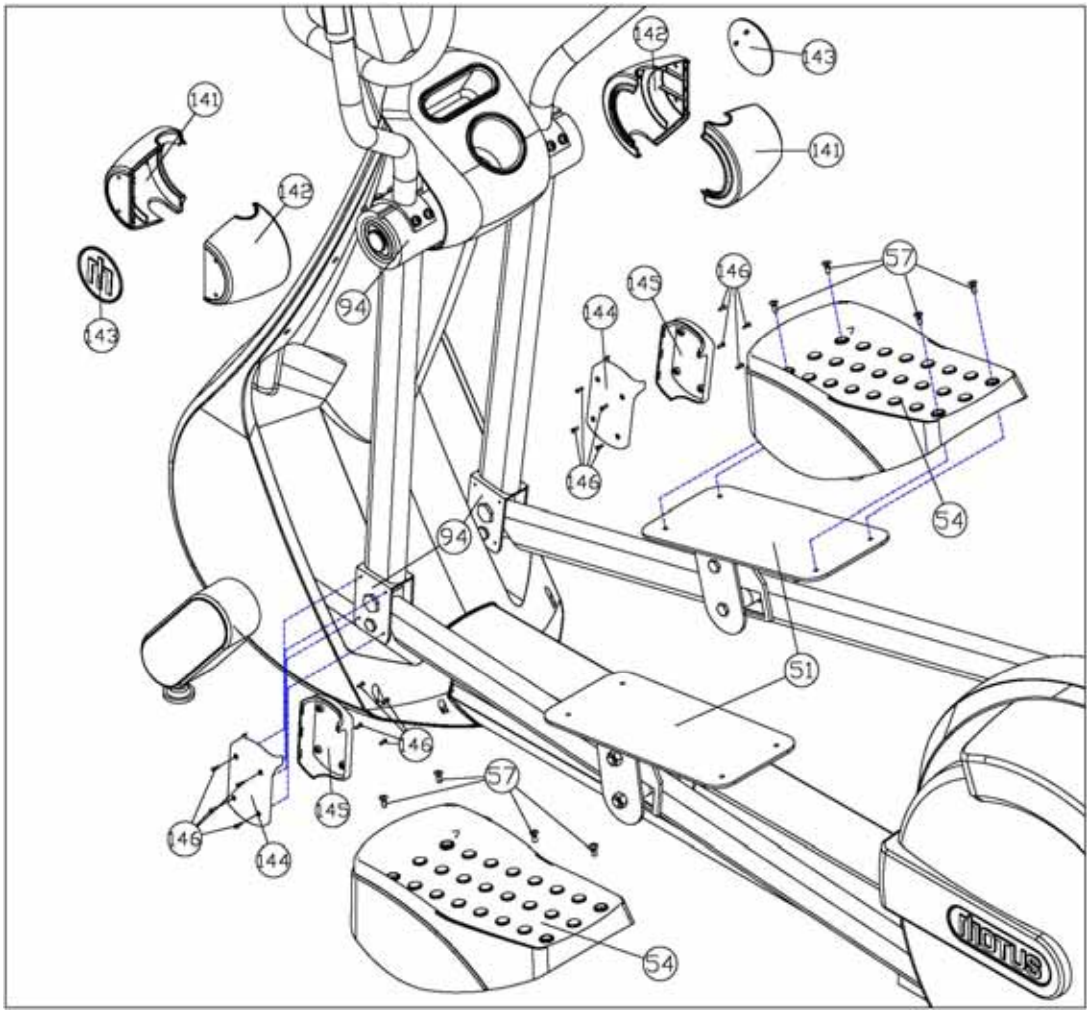
4) Remove CAP HEX NUT (163) and PLANE WASHER (49) using 24 mm spanner.

5) Pull COUPLER FRAME (42) out of CRANK ASS'Y-230 (39) by lifting it off.

6) Remove H/S HEX BOLT (41) and HEX LOCK NUT (13) using 21 mm spanner and then slide CRANK ASS'Y-230 (39) off the Shaft (18) of the Pulley (19).

7) Install new CRANK ASS'Y-230 (39) in reverse order.

2.7 How to Disassemble the PEDAL BASE, LOW JOINT CAP or HANDLE PIVOT JOINT CAP



2.7.1 How to Disassemble the PEDAL BASE

1) Remove the plastic PEDAL BASE (54) by loosening four PILLOW CROSS BOLTs (57).

2) Reassemble the parts in reverse order.

2.7.2 How to Disassemble the LOW JOINT CAP

1) Remove LOW JOINT CAP-T (144) by loosening four BUTTON CROSS BOLTs (146) using Phillips driver.

2) Remove LOW JOINT CAP-B (145) by loosening four BUTTON CROSS BOLTs (146) using Phillips driver.

3) Reassemble the parts in reverse order.

2.7.3 How to Disassemble the HANDLE PIVOT JOINT CAP

1) Remove HANDLE PIVOT JOINT CAP BADGE (143) by using sharp-tip screw driver to lift it

out of the engaged HANDLE PIVOT JOINT CAP-T (141) and HANDLE PIVOT JOINT CAP-B (142).

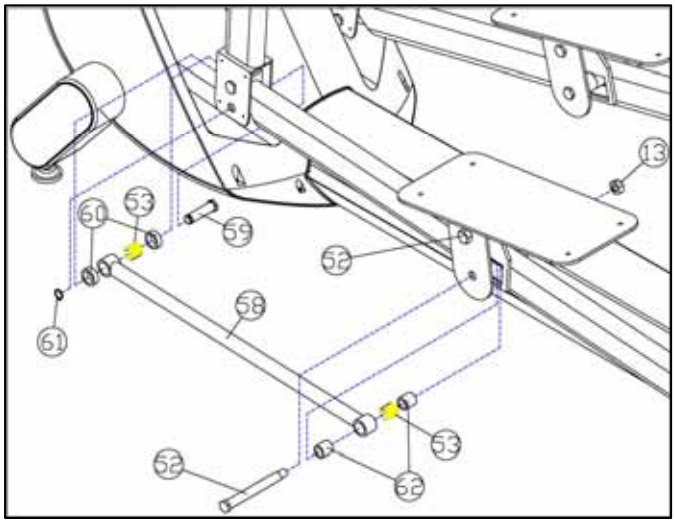
2) Remove the HANDLE PIVOT JOINT CAP-T (141) and HANDLE PIVOT JOINT CAP-B (142) from HANDLE CRANK FRAME (94) by opening these two parts while pushing the edge of the engaged HANDLE PIVOT JOINT CAP-T (141) and HANDLE PIVOT JOINT CAP-B (142).

3) Reassemble the parts in reverse order.

2.8 How to Replace the NEEDLE BEARINGS inside the PEDAL COUPLER

(Or How to Replace the OILLESS BUSH inside the PEDAL COUPLER with NEEDLE BEARINGS)

1) Disassemble the plastic PEDAL BASE. See “2.7.1 How to Disassemble PEDAL BASE”



2) Loosen the upper PEDAL SHAFT (52) and the upper HEX LOCK NUT (13) **a little** by using 17 mm spanner and 19 mm spanner each. Slight loosening through this process makes it easy to remove lower PEDAL SHAFT (52) securing the PEDAL COUPLER (58) to the PEDAL FRAME.

3) Remove the lower PEDAL SHAFT (52) and the lower HEX LOCK NUT (13) by using 17 mm spanner and 19 mm spanner each. Two PEDAL REAR SHAFT BUSHes (62) are also removed.

4) Remove the SNAP RING (61) securing the PEDAL COUPLER (58) to the COUPLER FRAME (42) by using snap ring pliers.

5) Remove the PEDAL FRONT SHAFT (59) by pulling out it. Two PEDAL FRONT SHAFT BUSHes (60) are also removed.

6) Take out the PEDAL COUPLER (58), which is inside the pipe “COUPLER FRAME (42)”, from the front side of the pipe.

7) Remove the NEEDLE BEARINGS (53, or **oil-less bush before update**) which are inside the both end of the PEDAL COUPLER (58).

8) Install new NEEDLE BEARINGS in reverse order.

2.9 How to Replace the OILLESS BUSH inside the COUPLER FRAME

1) Disassemble the plastic PEDAL BASE. See “2.7.1 How to Disassemble PEDAL BASE”

2) Loosen the upper PEDAL SHAFT (52) and the upper HEX LOCK NUT (13) **a little** by using 17 mm spanner and 19 mm spanner each. Slight loosening through this process makes it easy to remove lower PEDAL SHAFT (52) securing the PEDAL COUPLER (58) to the PEDAL FRAME.

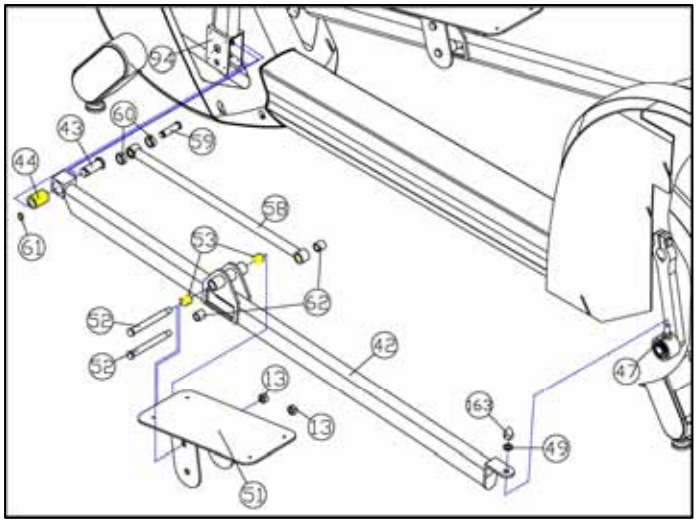
3) Remove the lower PEDAL SHAFT (52) and the lower HEX LOCK NUT (13) by using 17 mm spanner and 19 mm spanner each. Two PEDAL REAR SHAFT BUSHes (62) are also removed.

4) Remove the SNAP RING (61) securing the PEDAL COUPLER (58) to the COUPLER FRAME (42) by using snap ring pliers.

5) Remove the PEDAL FRONT SHAFT (59) by pulling out it. Two PEDAL FRONT SHAFT BUSHes (60) are also removed.

6) Take out the PEDAL COUPLER (58), which is inside the pipe “COUPLER FRAME (42)”, from the front side of the pipe.

7) Remove the PEDAL FRAME (51) from HANDLE CRANK FRAME (94) by loosening the upper PEDAL SHAFT (52) and the upper HEX LOCK NUT (13) by using 17 mm spanner and 19 mm spanner each.



8) Remove the COUPLER FRONT SHAFT (43) from the HANDLE CRANK FRAME (94). Be careful the COUPLER FRAME (42) can be fallen out of the HANDLE CRANK FRAME (94).

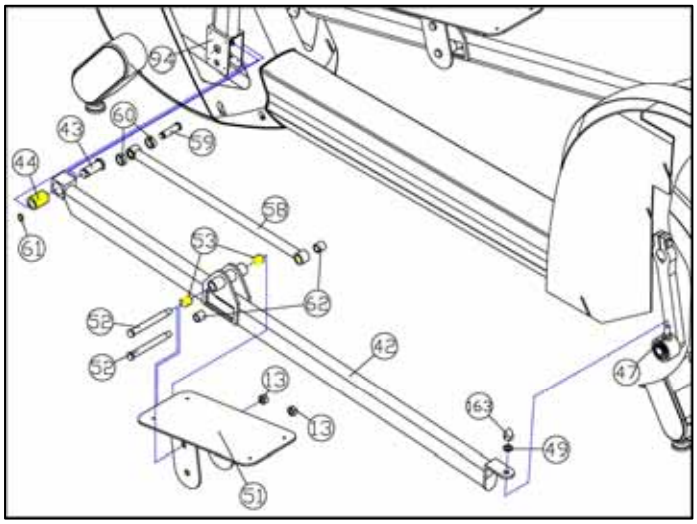
9) Remove the CAP HEX NUT (163) from the COUPLER REAR HOUSING (47) by using 24 mm spanner.

10) Remove the COUPLER FRAME (42) from the COUPLER REAR HOUSING (47) by lifting it up.

11) Remove the OILLESS BUSH (44, HB203040) or the OILLESS BUSH (53, HB1420).

12) Apply a bearing grease to the outer surface of the OILLES BUSH and then install the OILLESS BUSH in reverse order.

2.10 How to Replace the PEDAL SHAFT



1) Disassemble the plastic PEDAL BASE. See “2.7.1 How to Disassemble PEDAL BASE”

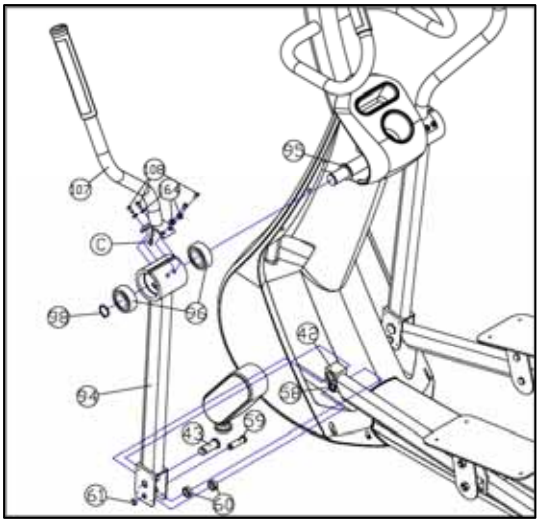
2) Loosen the upper PEDAL SHAFT (52) and the upper HEX LOCK NUT (13) **a little** by using 17 mm spanner and 19 mm spanner each. Slight loosening through this process makes it easy to remove lower PEDAL SHAFT (52) securing the PEDAL COUPLER (58) to the PEDAL FRAME.

3) Remove the lower PEDAL SHAFT (52) and the lower HEX LOCK NUT (13) by using 17 mm spanner and 19 mm spanner each. Two PEDAL REAR SHAFT BUSHes (62) are also removed.

4) Remove the upper PEDAL SHAFT (52) and the upper HEX LOCK NUT (13) by using 17 mm spanner and 19 mm spanner each.

5) Install new PEDAL SHAFT (52) in reverse order.

2.11 How to Replace the HANDLE CRANK FRAME



1) Remove SNAP RING (61) by using snap ring pliers.

2) Remove the PEDAL FRONT SHAFT (59) from the HANDLE CRANK FRAME (94). PEDAL FRONT SHAFT BUSH (60) is also removed.

3) Remove the COUPLER FRONT SHAFT (43) from the HANDLE CRANK FRAME (94). Be careful the COUPLER FRAME (42) can be fallen out of the HANDLE CRANK FRAME (94).

4) Remove HANDLE BAR-L (107) by loosening four ALLEN BUTTON BOLTs (108) using 6 mm Wrench.

5) Disconnect the interconnected Heart Rate Cable(C) under HANDLE BAR-L (107).

6) Remove SNAP RING (98) by using snap ring pliers.

7) Remove the HANDLE CRANK FRAME (94) from the AXIS toward the longitudinal direction of the AXIS (960) and keep the PLANE WAHSER (95) in position as shown.

8) Install new HANDLE CRANK FRAME (94) in reverse order.

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2.12 How to Replace the Heart Rate SENSORS

- Pending -

SECTION III

HOW TO REPLACE & REPAIR GUIDE

Electronic PCB

3.1 How to Replace the LCD Screen in Model M770EL
3.2 How to Replace the A/D Board in Model M770EL
3.3 How to Replace the MPU Board in Model MM770EL
3.4 How to Replace the MPU Board in Model M770E
3.5 How to Replace the OPERATION BUTTON Board
3.6 How to Replace the LAMP INVERTER Board in Model M770E
3.7 How to Replace the Program BUTTON Board, OSD BUTTON Board & AUDIO INTERFACE & DOWNLOAD Board in Model M770EL
3.8 How to Replace the DRIVE Board.
3.9 How to Replace the BATTERY for M770E
3.10 How to Replace the SMPS-5V (or MPU POWER SUPPLY)
3.11 How to Replace the LCD POWER ADAPTER.

3.1 How to Replace the LCD Screen in Model M770EL

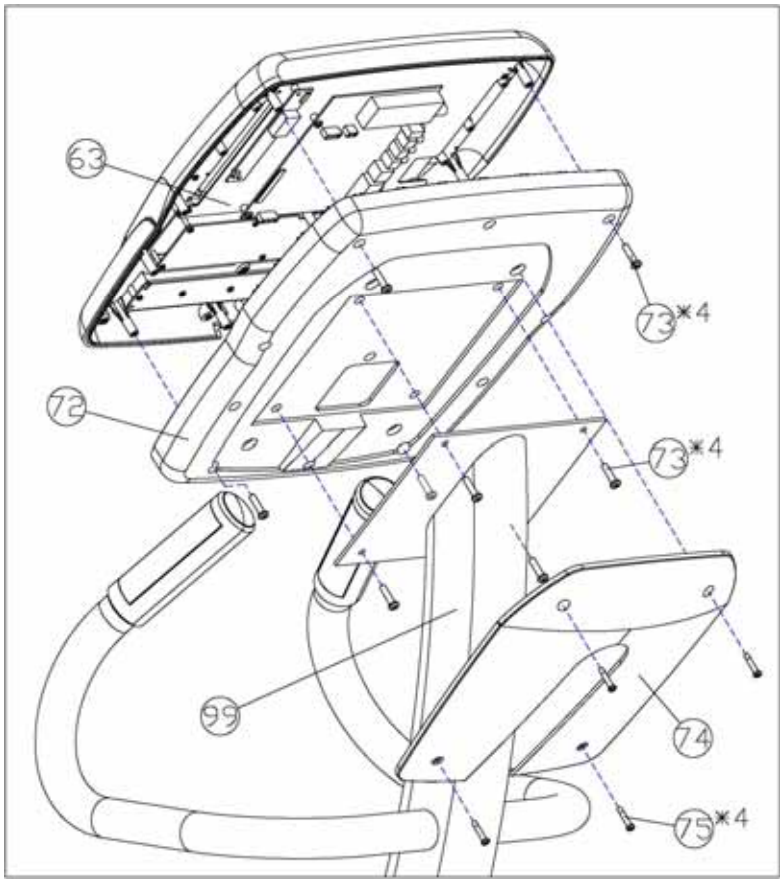


Fig 3a CONSOLE & POST

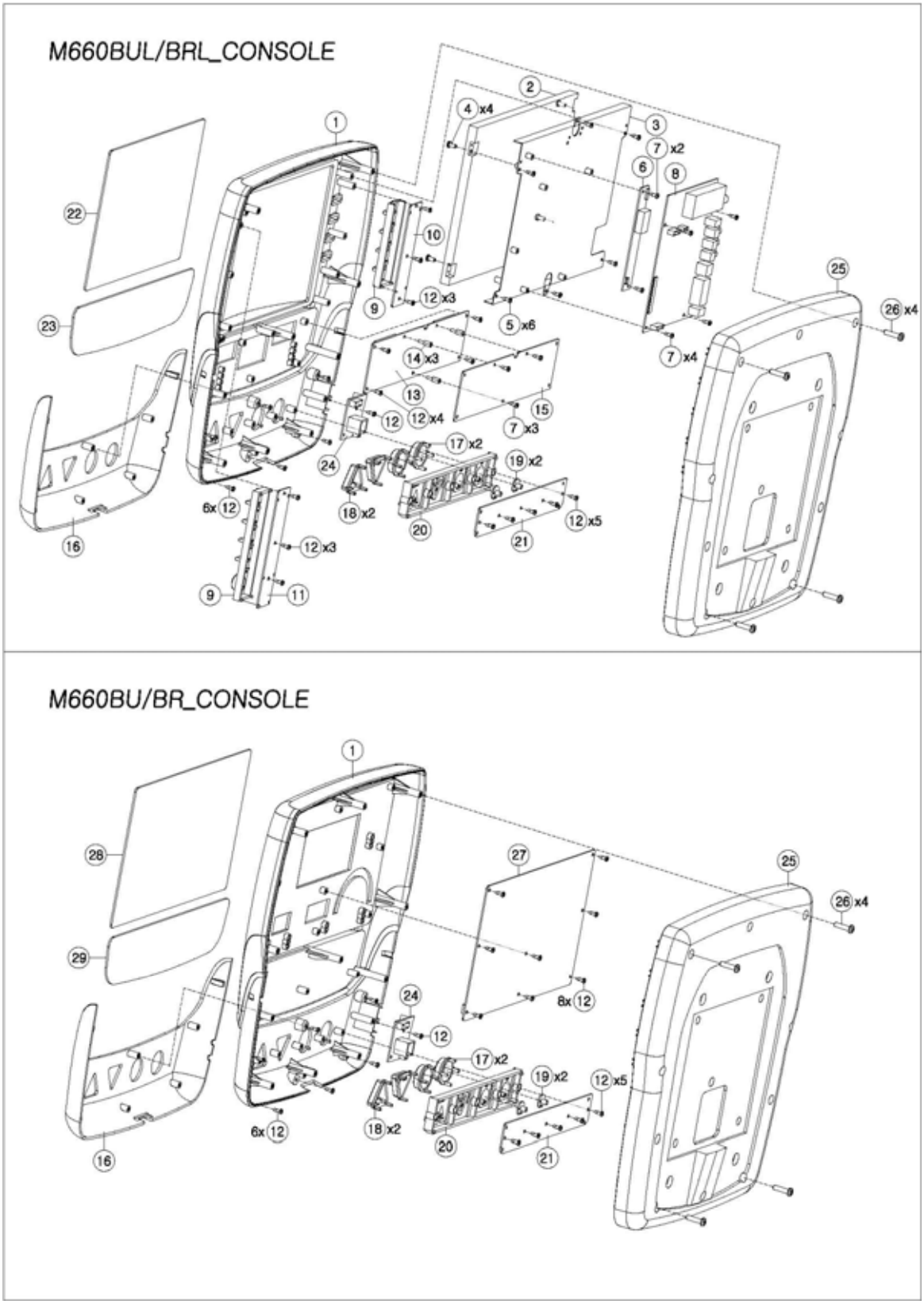


Fig 3b CONSOLE

Do the steps below while referring to Fig 3a CONSOLE & POST, Fig 3b CONSOLE and Section 4 ELECTRONIC PCB, CONNECTOR AND CABLE OVERVIEW.

1) Turn off the unit power at the switch and then unplug the line cord at wall outlet.
2) Remove the DISPLAY REAR COVER (74) from the DISPLAY PANEL BOTTM (72) by unscrewing four screws (75).
3) Remove the DISPLAY PANEL TOP (63) from the DISPLAY PANEL BOTTOM (72) by unscrewing four screws (73) securing the DISPLAY PANEL TOP (63).
4) Disconnect all the cables from the DISPLAY PANEL TOP (63) and then place the DISPLAY PANEL TOP (63) on the flat and clean surface so that the LCD screen faces downward.
5) Disconnect one end of the OSD BUTTON CABLE (CB21) from the side of A/D BOARD (8). The OSD BUTTON CABLE (CB21) is connected in between the A/D BOARD (8) and OSD BOARD (11).
6) Remove the LCD PANEL BRACKET (3) from the DISPLAY PANEL TOP (1) by unscrewing six screws (7).
7) Disconnect one end of the LVDS CABLE (CB31) from the side of the LCD PANEL (2). The other end of the LVDS CABLE (CB31) doesn't need to be disconnected from the A/D BOARD (8).
8) Disconnect the LAMP INVERTER CABLE (CB32) from the LAMP INVERTER (6).
9) Place the LCD BRACKET (3) upside down so that the LCD PANEL (2) faces upward.
10) Remove the LCD PANEL (2) by unscrewing four screws (4) securing the LCD PANEL (2) to the LCD BRACKET.
11) Install new LCD PANEL (2) in reverse order.

3.2 How to Replace the A/D Board in Model M770EL

Do the steps below while referring to Fig 3a CONSOLE & POST, Fig 3b CONSOLE and Section 4 ELECTRONIC PCB, CONNECTOR AND CABLE OVERVIEW.

1) Turn off the unit power at the switch and then unplug the line cord at wall outlet.
2) Remove the DISPLAY REAR COVER (74) from the DISPLAY PANEL BOTTM (73) by unscrewing four screws (75).
3) Remove four screws (73) securing the DISPLAY PANEL TOP (63) to the DISPLAY PANEL BOTTOM (72).
4) Lift off the DISPLAY PANEL TOP (63) while disconnecting all the cables from the DISPLAY PANEL TOP (63) and then place the DISPLAY PANEL TOP (63) on the flat and clean surface so that the LCD screen faces downward.
5) Disconnect all the cables from the A/D BOARD (8).
6) Remove the A/D BOARD (8) from the LCD PANEL BRACKET (3) by unscrewing four screws (7).
7) Install new A/D BOARD (8) in reverse order.

3.3 How to Replace the MPU Board in Model M770EL

Do the steps below while referring to Fig 3a CONSOLE & POST, Fig 3b CONSOLE and Section 4 ELECTRONIC PCB, CONNECTOR AND CABLE OVERVIEW.

1) Turn off the unit power at the switch and then unplug the line cord at wall outlet.
2) Remove the DISPLAY REAR COVER (74) from the DISPLAY PANEL BOTTM (72) by unscrewing four screws (75).
3) Remove four screws (73) securing the DISPLAY PANEL TOP (63) to the DISPLAY PANEL BOTTOM (72).
4) Lift off the DISPLAY PANEL TOP (63) while disconnecting all the cables from the DISPLAY PANEL TOP (63) and then place the DISPLAY PANEL TOP (631) on the flat and clean surface so that the LCD screen faces downward.
5) Disconnect all the cables from the MPU BOARD_FRONT (13).
6) Remove three screws (7) securing the MPU BOARD_BACK (15) to the MPU BOARD_FRONT (13).
7) Carefully lift the MPU BOARD_BACK (15) off the MPU BOARD_FRONT (13) so that the pins on the both edges of the MPU BOARD_FRONT are not damaged or bended.
8) Remove four screws (12) and three HEXGON SPACER (14) securing the MPU BOARD_FRONT (13) to the DISPLAY PANEL_TOP (11).
9) Lift off the MPU BOARD_FRONT (13)
10) Install new MPU BOARD_FRONT or MPU BOARD_BACK in reverse order.

3.4 How to Replace the MPU Board in Model M770E

Do the steps below while referring to Fig 3a CONSOLE & POST, Fig 3b CONSOLE and Section 4 ELECTRONIC PCB, CONNECTOR AND CABLE OVERVIEW.

1) Remove the DISPLAY REAR COVER (74) from the DISPLAY PANEL BOTTM (72) by unscrewing four screws (75).
2) Remove four screws (73) securing the DISPLAY PANEL TOP (63) to the DISPLAY PANEL BOTTOM (72).
3) Lift off the DISPLAY PANEL TOP (63) while disconnecting all the cables from the DISPLAY PANEL TOP (63) and then place the DISPLAY PANEL TOP (63) on the flat and clean surface so that it faces downward.
4) Disconnect all the cables including Ribbon cable from the MPU BOARD (27).
5) Remove eight screws (12) securing the MPU BOARD (27) to the DISPLAY PANEL TOP (1).
6) Lift off the MPU BOARD (27) out of the DISPLAY PANEL TOP (1).
7) Install new MPU BOARD (27) in reverse order.

3.5 How to Replace the OPERATION BUTTON Board

Do the steps below while referring to Fig 3a CONSOLE & POST, Fig 3b CONSOLE and Section 4 ELECTRONIC PCB, CONNECTOR AND CABLE OVERVIEW.

1) If the machine is M770EL with LCD monitor, turn off the unit power at the switch and then unplug the line cord at wall outlet.
2) Remove the DISPLAY REAR COVER (74) from the DISPLAY PANEL BOTTM (72) by unscrewing four screws (75).
2) Remove four screws (73) securing the DISPLAY PANEL TOP (63) to the DISPLAY PANEL BOTTOM (72).
3) Lift off the DISPLAY PANEL TOP (63) while disconnecting all the cables from the DISPLAY PANEL TOP (63) and then place the DISPLAY PANEL TOP (63) on the flat and clean surface so that it faces downward.
4) Disconnect all of cables from the OPERATION BUTTON BOARD (21).
5) Remove the OPERATION BUTTON BOARD from the DISPLAY BUTTON CONTROL (20) by unscrewing five screws (12).
6) Install new OPERATION BUTTON BOARD (21) in reverse order.

3.6 How to Replace the LAMP INVERTER Board in Model M770EL

Do the steps below while referring to Fig 3a CONSOLE & POST, Fig 3b CONSOLE and Section 4 ELECTRONIC PCB, CONNECTOR AND CABLE OVERVIEW.

1) Turn off the unit power at the switch and then unplug the line cord at wall outlet.
2) Remove the DISPLAY REAR COVER (74) from the DISPLAY PANEL BOTTM (72) by unscrewing four screws (75).
3) Remove four screws (73) securing the DISPLAY PANEL TOP (63) to the DISPLAY PANEL BOTTOM (72).
4) Lift off the DISPLAY PANEL TOP (63) while disconnecting all the cables from the DISPLAY PANEL TOP (63) and then place the DISPLAY PANEL TOP (63) on the flat and clean surface so that the LCD screen faces downward.
5) On the side of the LAMP INVERTER board (6), disconnect the LAMP INVERTER CABLE (CB32) which is connected between the LAMP INVERTER board (6) and A/D BOARD (8).
6) Disconnect all the cables between the LAMP INVERTER board (6) and LCD panel (21).
7) Remove the LAMP INVERTER board (6) from the LCD PANEL BRACKET (3) by unscrewing two screws (12).
8) Install new LAMP INVERTER board in reverse order.

3.7 How to Replace the Program BUTTON Board, OSD BUTTON Board & AUDIO INTERFACE & DOWNLOAD Board in Model M770EL

Do the steps below while referring to Fig 3a CONSOLE & POST, Fig 3b CONSOLE and Section 4 ELECTRONIC PCB, CONNECTOR AND CABLE OVERVIEW.

1) Turn off the unit power at the switch and then unplug the line cord at wall outlet.
2) Remove the DISPLAY REAR COVER (74) from the DISPLAY PANEL BOTTM (72) by unscrewing four screws (75).
3) Remove four screws (73) securing the DISPLAY PANEL TOP (63) to the DISPLAY PANEL BOTTOM (72).
4) Lift off the DISPLAY PANEL TOP (63) while disconnecting all the cables from the DISPLAY PANEL TOP (63) and then place the DISPLAY PANEL TOP (63) on the flat and clean surface so that the LCD screen faces downward.

Program BUTTON Board

5) On the side of the PROGRAM BUTTON Board (10), disconnect the PROGRAM BUTTON CABLE (CB19) which is connected between the MPU_BOARD_FRONT (13) and PROGRAM BUTTON Board (10)
6) Remove the PROGRAM BUTTON Board (10) from the DISPLAY BUTTON_LCD (9) by unscrewing three screws (12).
7) Install new PROGRAM BUTTON Board (10) in reverse order.

OSD BUTTON Board

5) On the side of the OSD BUTTON Board (11), disconnect the OSD BUTTON CABLE (CB21) which is connected between the A/D Board (8) and OSD BUTTON Board (11),
6) Remove the OSD BUTTON Board (11) from the DISPLAY BUTTON_LCD (9) by unscrewing three screws (12).
7) Install new OSD BUTTON Board (11) in reverse order.

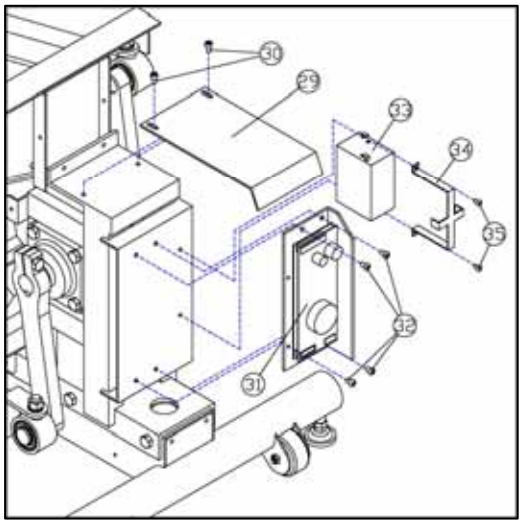
AUDIO INTERFACE & DOWNLOAD Board

5) Disconnect the AUDIO OUT CABLE (CB21) and DOWNLOAD CABLE (CB10) from the side of the AUDIO INTERFACE & DOWNLOAD Board (24).

6) Remove the AUDIO INTERFACE & DOWNLOAD Board (24) from the DISPLAY BUTTON_LCD (9) by unscrewing three screws (12).

7) Install new AUDIO INTERFACE & DOWNLOAD Board (24) in reverse order.

3.8 How to Replace the DRIVE Board



1) Disconnect three cables from the DRIVE PCB (31).

2) Remove the DRIVE PCB (31) by loosening four BUTTON CROSS BOLTs (32).

3) Install new DRIVE PCB (31) in reverse order.

Make sure three cables are firmly connected to the DRIVE PCB (31).

3.9 How to Replace the BATTERY for M770E

1) Disconnect two cables from the BATTERY(33).

2) Remove the BATTERY (33) by loosening two BUTTON CROSS BOLTs (35).

3) Install new BATTERY (33) in reverse order.

Make sure two cables are firmly connected to the BATTERY (33).

3.10 How to Replace the SMPS-5V (or MPU POWER SUPPLY) in M770EL

Applicable to old version before Nov., 2007

1) Turn off the unit power at switch and then unplug the power cord at the wall outlet.

2) Remove the Badge (143) from the Handle Pivot Joint Cap (141, 142).

3) Remove the Handle Pivot Joint Cap (141, 142) by separating engaged Handle Pivot Joint Cap (141, 142) into two pieces.

4) Lift up the Bottle Holder (130) and Accessory Holder (129) from the Handle Pivot Cover (127).

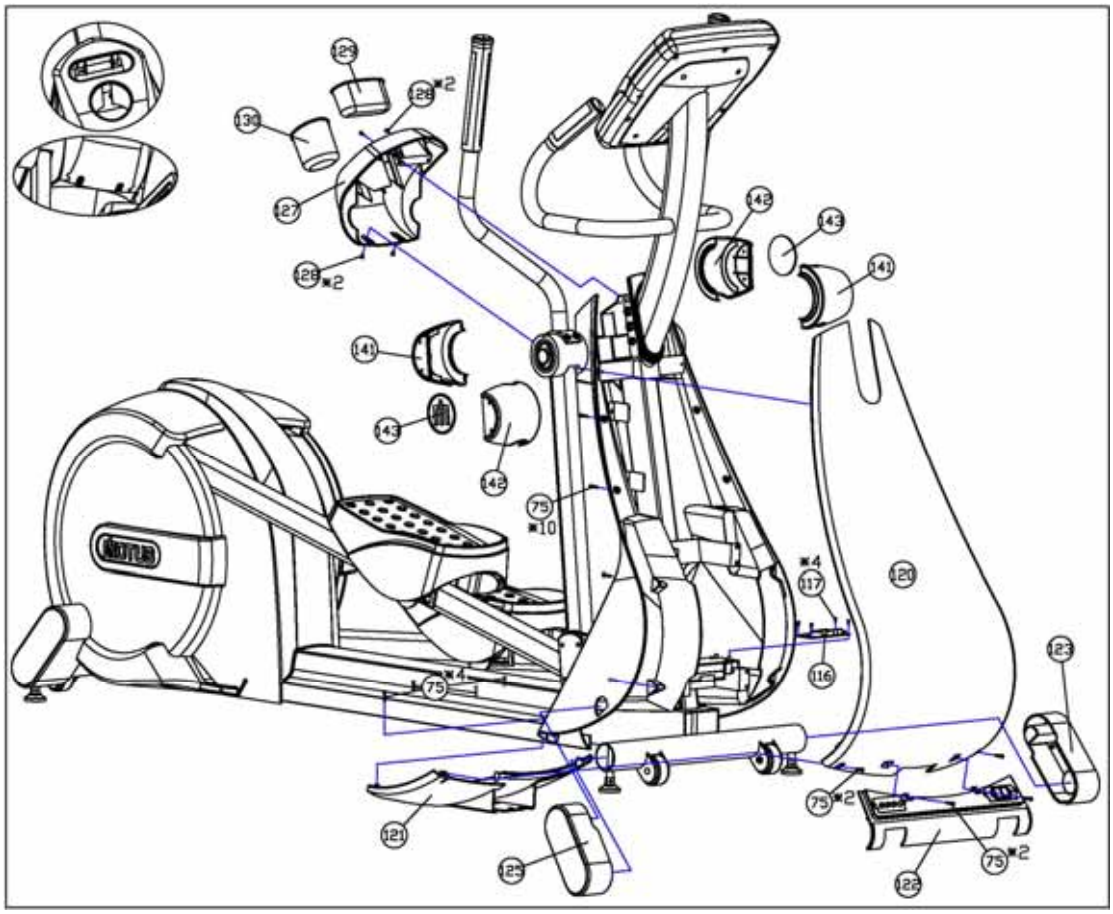
5) Remove four Button Cross Bolts (128) securing the Handle Pivot Cover (127) and then remove the Handle Pivot Cover (127) from the unit.

6) Remove the Front Stabilizer Cover (123, 125) from the unit by pulling them out by hand or using a rubber hammer.

7) Remove two Button Screws (75) securing the Front Stabilizer Cover-C (122) and remove the Front Stabilizer Cover-C (122) from the unit while disconnecting all of cables.

8) Remove six Button Screws (75) securing the Front Bottom Cover (121) and remove the Front Bottom Cover (121)

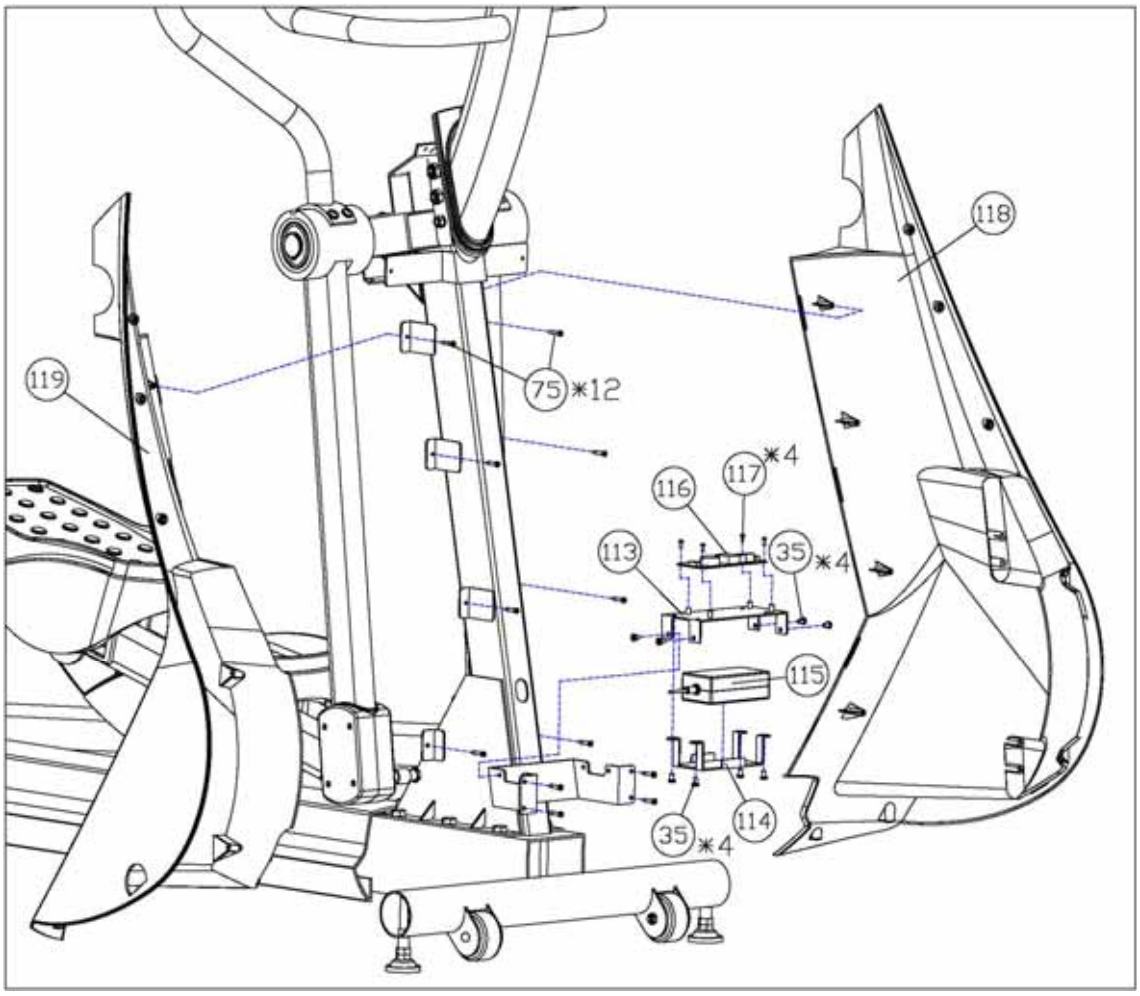
9) Remove ten Button Screws (75) securing the Front Outer Cover (120) and remove the Front Outer Cover (120) from the unit.



10) Disconnect all of cables from the SMPS (116).

11) Remove four Screws (117) securing the SMPS (116) to the SMPS-BRK (113).

12) Install new SMPS (116) in reverse order.



3.11 How to Replace the LCD POWER ADAPTER (or LCD Power Supply)

Applicable to old version before Nov., 2007

1) Turn off the unit power at switch and then unplug the power cord at the wall outlet.

2) Remove the Badge (143) from the Handle Pivot Joint Cap (141, 142).

3) Remove the Handle Pivot Joint Cap (141, 142) by separating engaged Handle Pivot Joint Cap (141, 142) into two pieces.

4) Lift up the Bottle Holder (130) and Accessory Holder (129) from the Handle Pivot Cover (127).

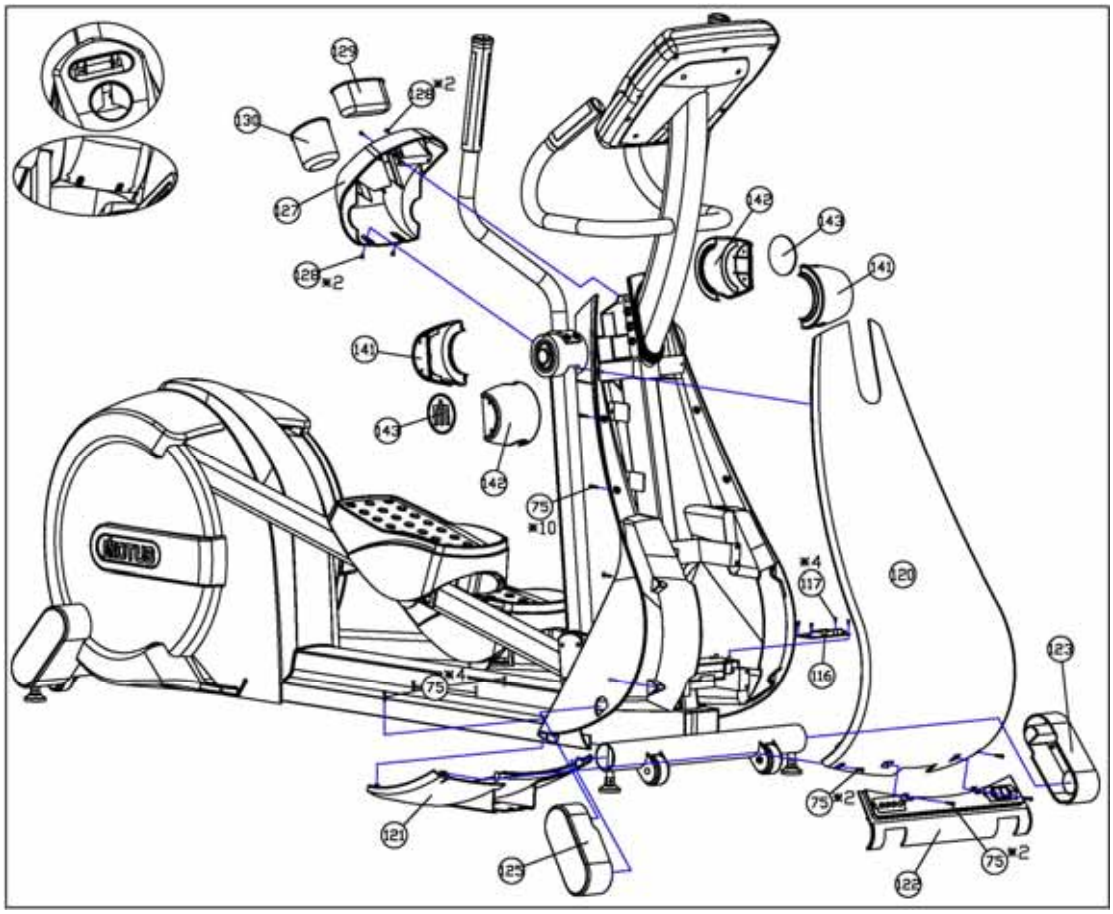
5) Remove four Button Cross Bolts (128) securing the Handle Pivot Cover (127) and then remove the Handle Pivot Cover (127) from the unit.

6) Remove the Front Stabilizer Cover (123, 125) from the unit by pulling them out by hand or using a rubber hammer.

7) Remove two Button Screws (75) securing the Front Stabilizer Cover-C (122) and remove the Front Stabilizer Cover-C (122) from the unit while disconnecting all of cables.

8) Remove six Button Screws (75) securing the Front Bottom Cover (121) and remove the Front Bottom Cover (121)

9) Remove ten Button Screws (75) securing the Front Outer Cover (120) and remove the Front Outer Cover (120) from the unit.



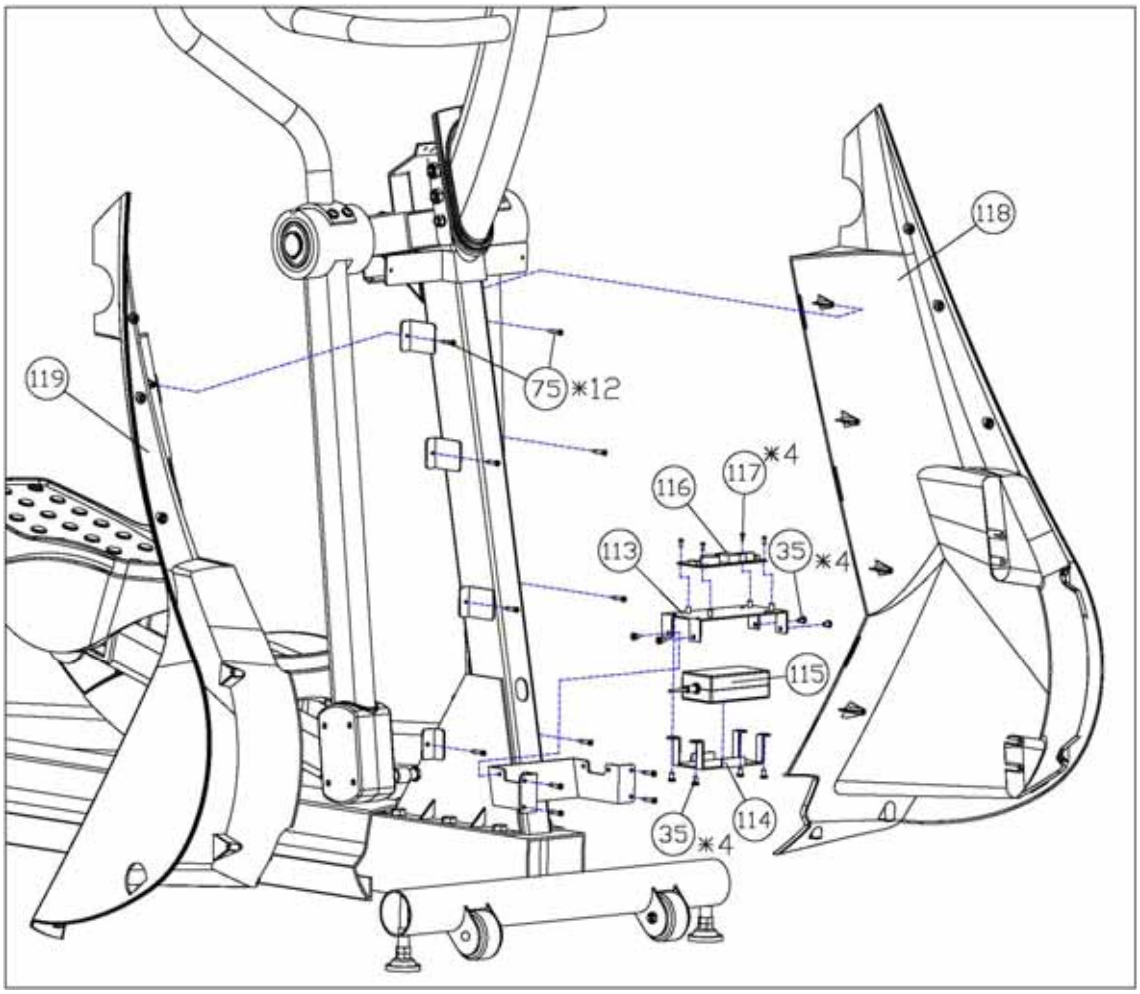
10) Remove twelve Button Screws (75) securing the Front Inner Cover (118,119) and then remove the Front Inner Cover (118,119) from the unit.

11) Disconnect all of cables from the LCD Power Supply (15) and SMPS (116).

12) Remove four Button Cross Bolts (115) securing the SMPS-BRK (113) and then remove the SMPS-BRK (113) from the unit.

13) Remove four Button Cross Bolts (35) securing LCD Power Supply BRK (114) to SMPS-BRK (113) and then remove LCD Power Supply (115).

14) Install new LCD Power Supply (115) in reverse order.



SECTION IV

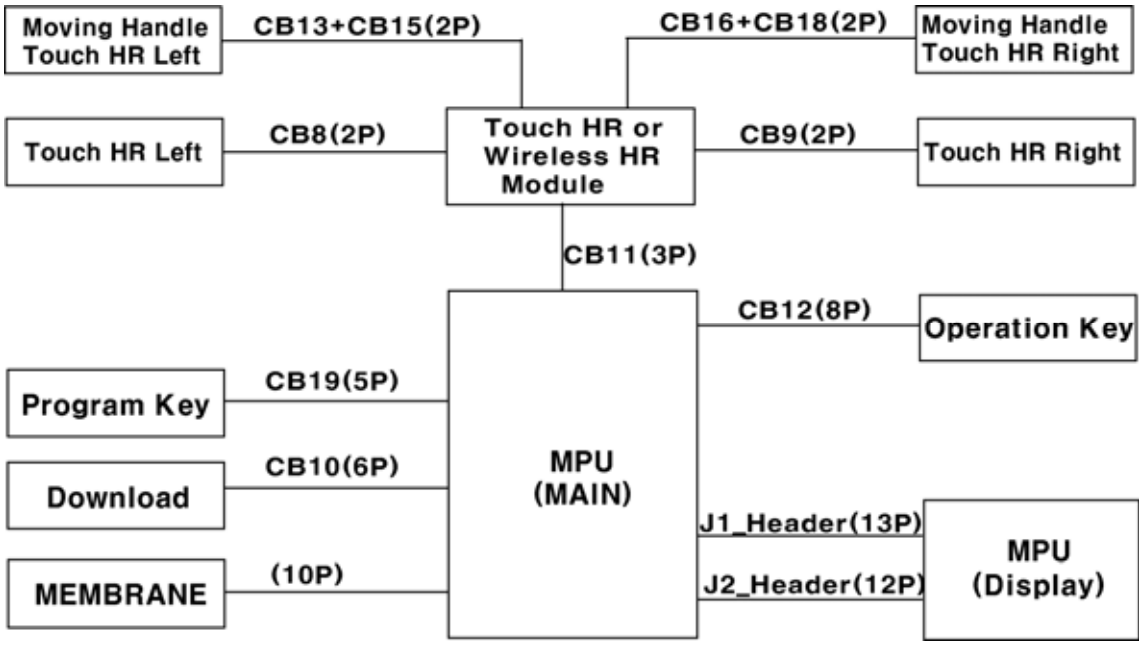
ELECTRONIC PCB, CONNECTOR AND CABLE OVERVIEW

4.1 Cable Connection Block Diagram
4.2 Electronic PCB, Connector and Pin Description
4.3 Cables & Connectors
4.4 Cable Diagram

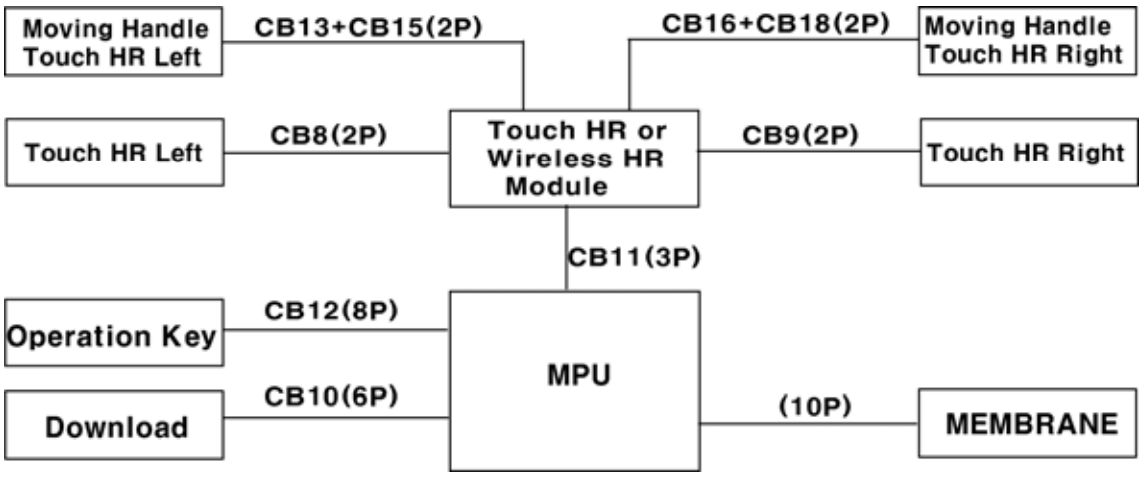
4.1 Cable Connection Block Diagram

1) MPU PCB on M770EL

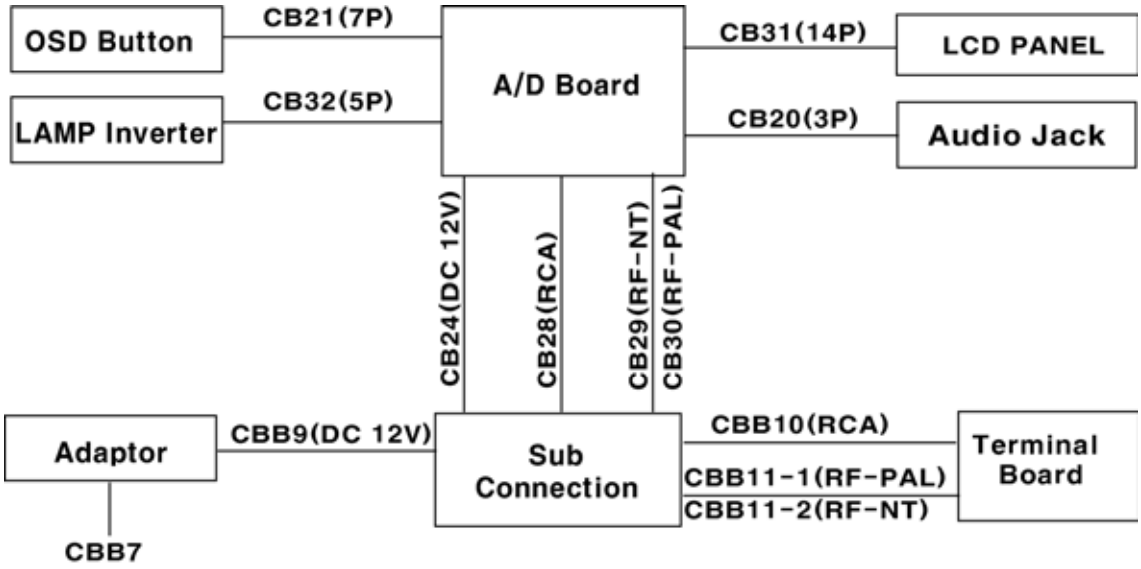
MPU_FRONT (Display), MPU_BACK (MAIN)



2) MPU PCB on M770E

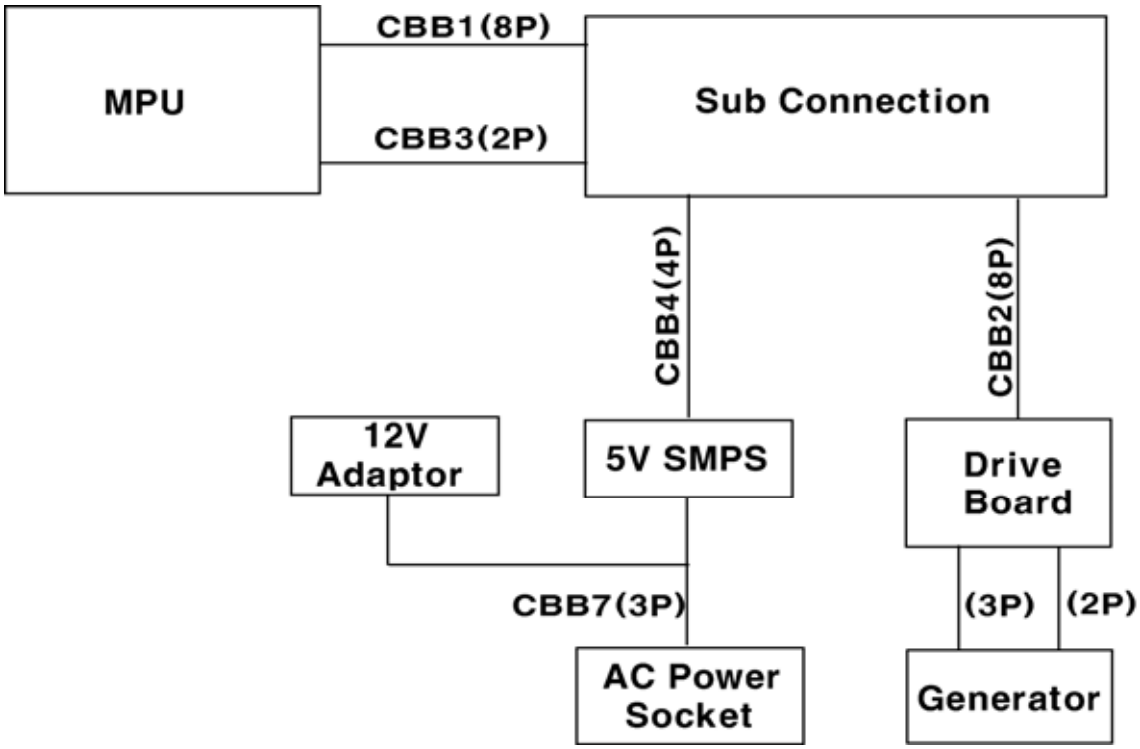


3) A/D BOARD on M770EL

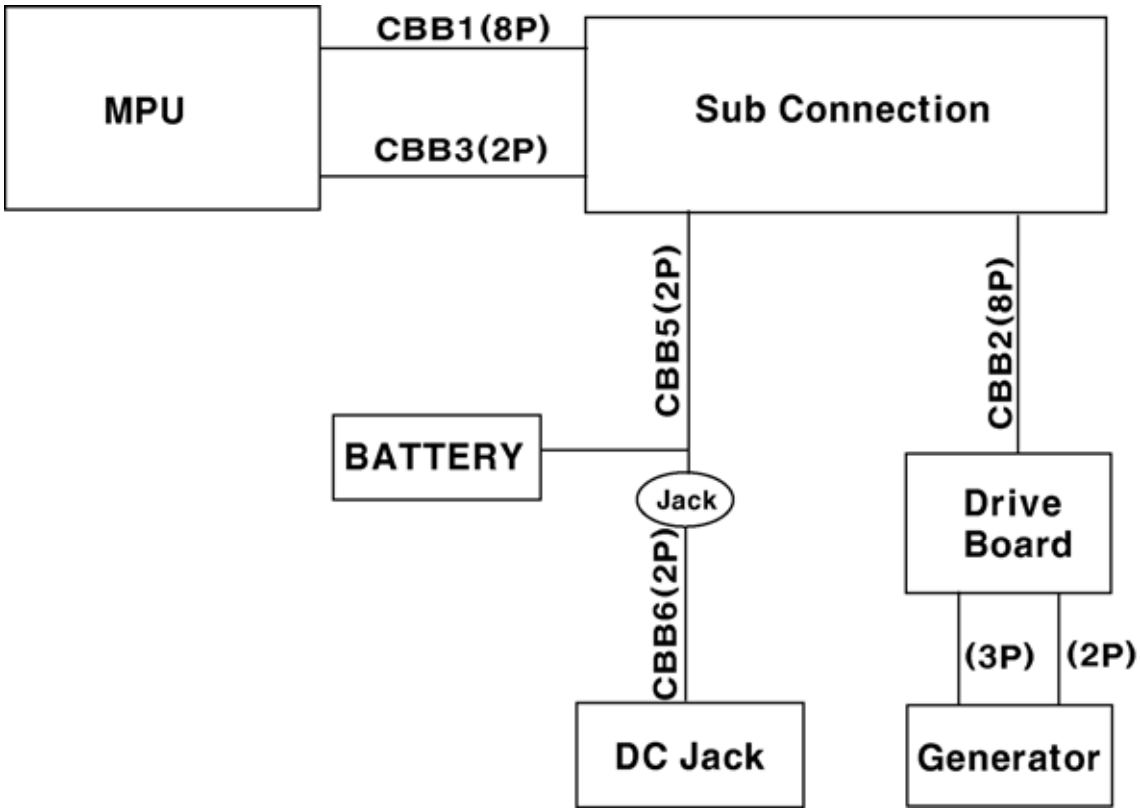


4) POWER BOARD

4-1) M770EL (DRIVE Board, SMPS-5V, LCD POWER ADAPTER)



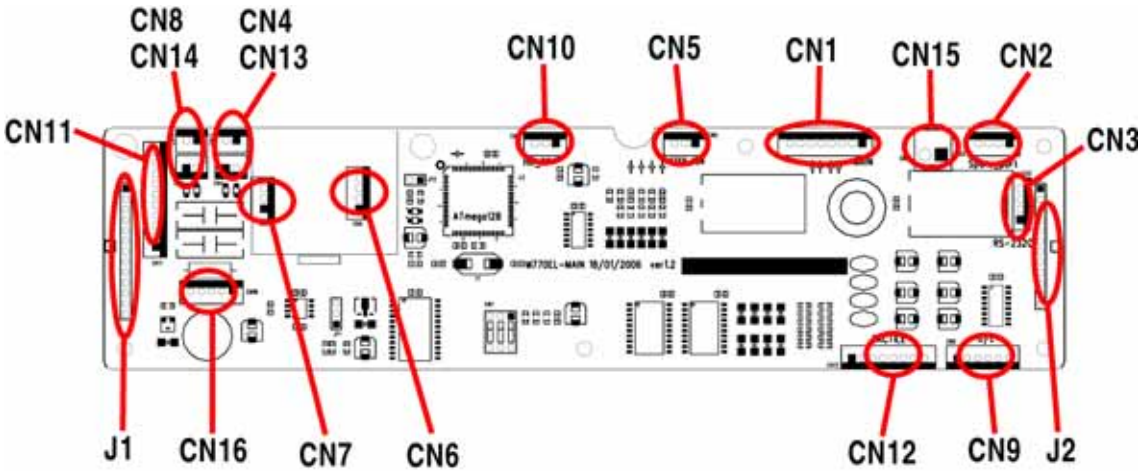
4-2) M770E (DRIVE Board)

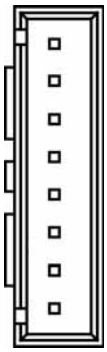
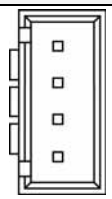
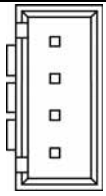


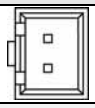
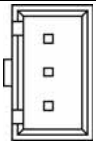
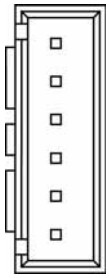
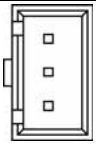
4.2 Electronic PCB, Connector and Pin Description

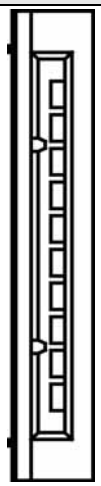
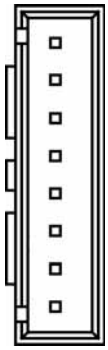
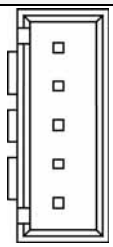
1) MPU PCB, M770EL

1-1) MPU_BACK (or MPU_Main)



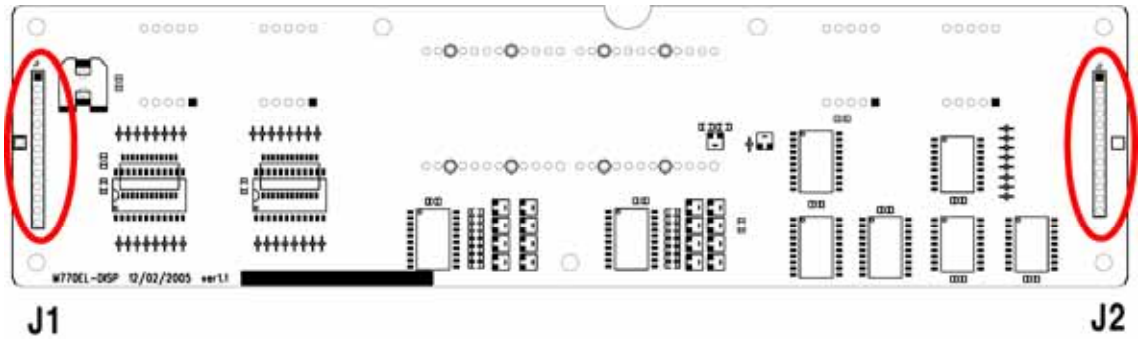
Connector	Location	Pin	Pin Name	Functional Description
CN 1 : Main Cable		1	NC	No Connection
		2	GND	Ground
		3	NC	No Connection
		4	NC	No Connection
		5	PWM	PWM Output
		6	E/P	Encoder Pulse Input
		7	GND	Ground
		8	NC	No Connection
CN 2 : Reserved Port (RS-232)		1	VCC	Not used
		2	TXD_PC	Not used
		3	RXD_PC	Not used
		4	GND	Not used
CN 3 : Serial Port (RS-232)		1	VCC	+5V
		2	TXD_PC	Transmit data (M770E → PC)
		3	RXD_PC	Receive data(PC → M770E)
		4	GND	Ground

Connector	Location	Pin	Pin Name	Functional Description
CN 4, CN 13 : Contact Heart Rate Sensor		1	Signal 1	Sensor Plate signal 1
		2	Signal 2	Sensor Plate signal 2
CN 5 : Step Sensor Not used		1	VCC	+5V
		2	STEP	Not used
		3	GND	Ground
CN 6 : Not used		1	VCC	VCC, Not used
		2	HR_TCH	Not used
		3	VCC	VCC, Not used
		4	GND	Ground, Not used
CN 7 : Not used		1	T_VCC	VCC, Not used
		2	T_GND	Ground, Not used
		3	T_VCC	VCC, Not used
CN 8, CN 14 : Contact Heart Rate Sensor		1	Signal 1	Sensor Plate signal 1
		2	Signal 2	Sensor Plate signal 2
CN 9 : Program Download		1	T232/PDO	Program Data Output
		2	VCC	+5V
		3	SCK	Serial Clock
		4	R232/PDI	Program Data Input
		5	RESET	Receive data
		6	GND	Ground
Connector	Location	Pin	Pin Name	Functional Description
CN 10 : Heart Rate Signal		1	Signal	Signal from Heart Rate Board
		2	VCC	+5V for Heart Rate
		3	GND	Ground for Heart Rate

Connector	Location	Pin	Pin Name	Functional Description
CN 11 : Overlay button (or Membrane)		1	B4	Data In 4
		2	B3	Data In 3
		3	B2	Data In 2
		4	B1	Data In 1
		5	Q6	Data Output 6
		6	Q5	Data Output 5
		7	Q4	Data Output 4
		8	Q3	Data Output 3
		9	Q2	Data Output 2
		10	Q1	Data Output 1
CN 12 : Operation Button		1	GND	Ground
		2	GND	Ground
		3	B4	Key Data Input 4
		4	B3	Key Data Input 3
		5	B2	Key Data Input 2
		6	B1	Key Data Input 1
		7	Q6	Key Scan Output 6
		8	VCC	Vcc
CN 15 : Main Power		1	VCC	VCC
		2	GND	Ground
CN 16 : Program Button		1	Q1	Data Output 1
		2	Q2	Data Output 2
		3	Q3	Data Output 3
		4	Q4	Data Output 4
		5	B4	Data In 4

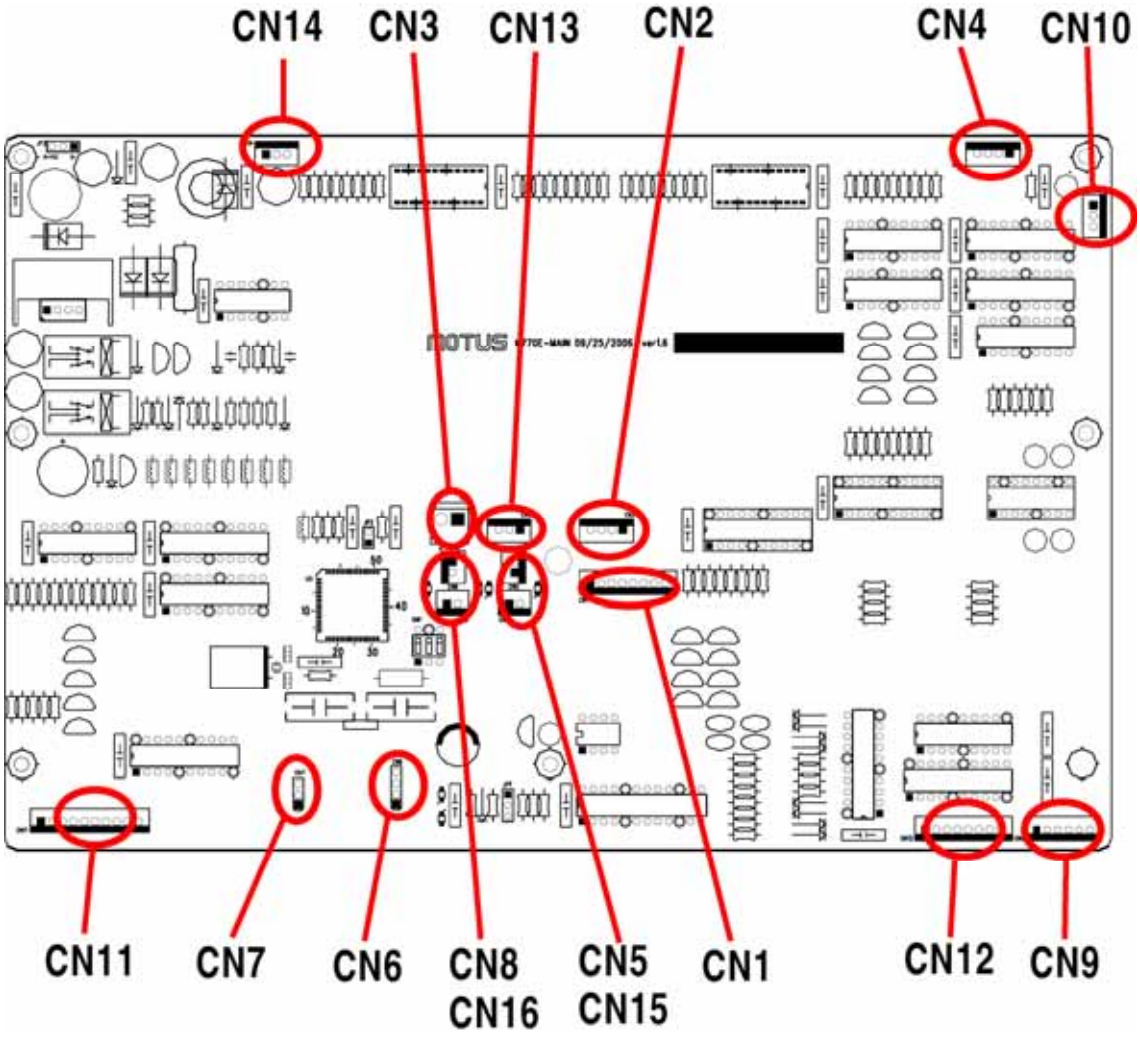
Connector	Location	Pin	Pin Name	Functional Description
J1 : Display Interface Header 1		1	VCC	Vcc
		2	VCC	Vcc
		3	VCC	Vcc
		4	CS0	Chip Select 0
		5	CS1	Chip Select 1
		6	CS3	Chip Select 3
		7	CS4	Chip Select 4
		8	CS5	Chip Select 5
		9	CS6	Chip Select 6
		10	CS8	Chip Select 8
		11	GND	Ground
		12	GND	Ground
		13	GND	Ground
J2 : Display Interface Header 2		1	AD0	Address/Data 0
		2	AD1	Address/Data 1
		3	AD2	Address/Data 2
		4	AD3	Address/Data 3
		5	AD4	Address/Data 4
		6	AD5	Address/Data 5
		7	AD6	Address/Data 6
		8	AD7	Address/Data 7
		9	D_CLK	Dot Display Clock
		10	D_LE	Dot Display Latch Enable
		11	D_RED	Dot Display RED Data
		12	D_GR	Dot Display GREEN Data

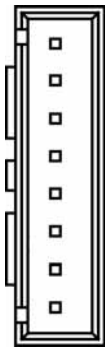
1-2) MPU_FRONT (or MPU_DISPLAY)

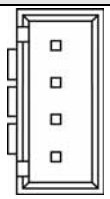
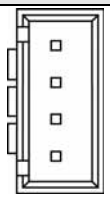
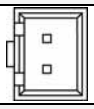
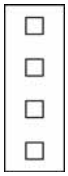
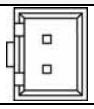


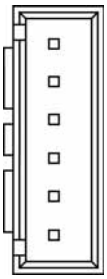
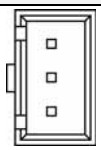
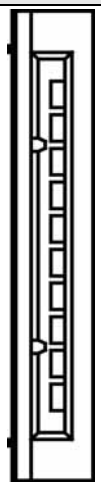
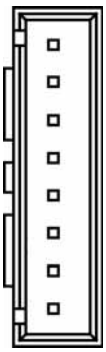
Connector	Location	Pin	Pin Name	Functional Description
J1 : MPU Interface Header 1		1	VCC	Vcc
		2	VCC	Vcc
		3	VCC	Vcc
		4	CS0	Chip Select 0
		5	CS1	Chip Select 1
		6	CS3	Chip Select 3
		7	CS4	Chip Select 4
		8	CS5	Chip Select 5
		9	CS6	Chip Select 6
		10	CS8	Chip Select 8
		11	GND	Ground
		12	GND	Ground
		13	GND	Ground
J2 : MPU Interface Header 2		1	AD0	Address/Data 0
		2	AD1	Address/Data 1
		3	AD2	Address/Data 2
		4	AD3	Address/Data 3
		5	AD4	Address/Data 4
		6	AD5	Address/Data 5
		7	AD6	Address/Data 6
		8	AD7	Address/Data 7
		9	D_CLK	Dot Display Clock
		10	D_LE	Dot Display Latch Enable
		11	D_RED	Dot Display RED Data
		12	D_GR	Dot Display GREEN Data

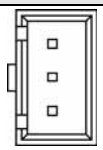
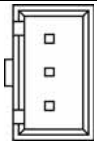
2) MPU PCB, M770E



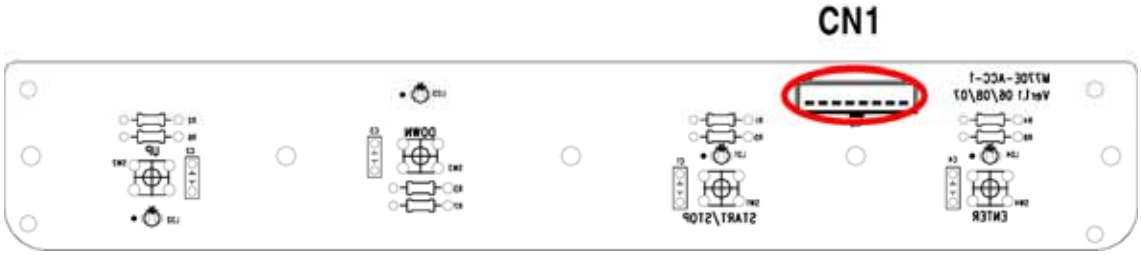
Connector	Location	Pin	Pin Name	Functional Description
CN 1 : Main Cable		1	VCC	Drive VCC 7.5V
		2	GND	Ground
		3	VCC	Drive VCC 7.5V
		4	NC	No Connection
		5	PWM	PWM Output
		6	E/P	Encoder Pulse Input
		7	GND	Ground
		8	VCC	Drive VCC 7.5V

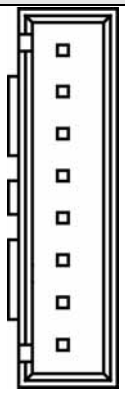
Connector	Location	Pin	Pin Name	Functional Description
CN 2 : Reserved Port (RS-232)		1	VCC	Not used
		2	TXD_PC	Not used
		3	RXD_PC	Not used
		4	GND	Not used
CN 3 : Battery Power		1	VCC	Battery VCC 6V
		2	GND	Ground
CN 4 : Serial Port (RS-232), Not used		1	VCC	+5V, Not used
		2	TXD_PC	Transmit data (M770E → PC), Not used
		3	RXD_PC	Receive data(PC → M770E), Not used
		4	GND	Ground, Not used
CN 5, CN 15 : Contact Heart Rate Sensor		1	Signal 1	Sensor Plate signal 1
		2	Signal 2	Sensor Plate signal 2
CN 6 : Not used		1	VCC	Not used
		2	HR_TCH	Not used
		3	VCC	Not used
		4	GND	Not used
CN 7 : Not used		1	T_VCC	Not used
		2	T_GND	Not used
		3	T_VCC	Not used
CN 8, CN 16 : Contact Heart Rate Sensor		1	Signal 1	Sensor Plate signal 1
		2	Signal 2	Sensor Plate signal 2

Connector	Location	Pin	Pin Name	Functional Description
CN 9 : Program Download		1	T232/PDO	Program Data Output
		2	VCC	+5V
		3	SCK	Serial Clock
		4	R232/PDI	Program Data Input
		5	RESET	Receive data
		6	GND	Ground
CN 10 : Heart Rate Signal		1	Signal	Signal from Heart Rate Board
		2	VCC	Heart Rate +5V
		3	GND	Heart Rate Ground
CN 11 : Overlay (or Membrane)		1	B4	Data In 4
		2	B3	Data In 3
		3	B2	Data In 2
		4	B1	Data In 1
		5	Q6	Data Output 6
		6	Q5	Data Output 5
		7	Q4	Data Output 4
		8	Q3	Data Output 3
		9	Q2	Data Output 2
		10	Q1	Data Output 1
CN 12 : Operation Button		1	GND	Ground
		2	GND	Ground
		3	B4	Key Data Input 4
		4	B3	Key Data Input 3
		5	B2	Key Data Input 2
		6	B1	Key Data Input 1
		7	Q6	Key Scan Output 6
		8	VCC	Vcc

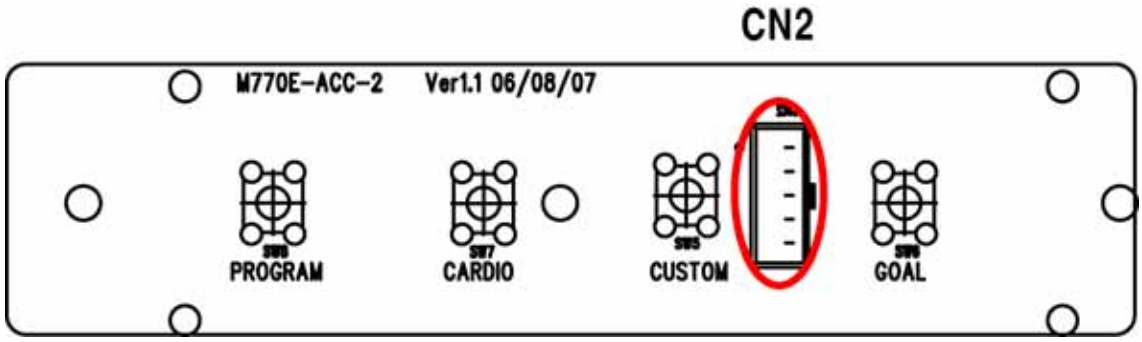
Connector	Location	Pin	Pin Name	Functional Description
CN 13 : Step Sensor		1	VCC	Not used
		2	STEP	Not used
		3	GND	Not used
CN 14 : Test Power		1	B+VCC	Not used
		2	GND	Not used
		3	VCC	Not used

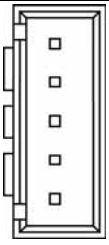
3) Operation Button Board



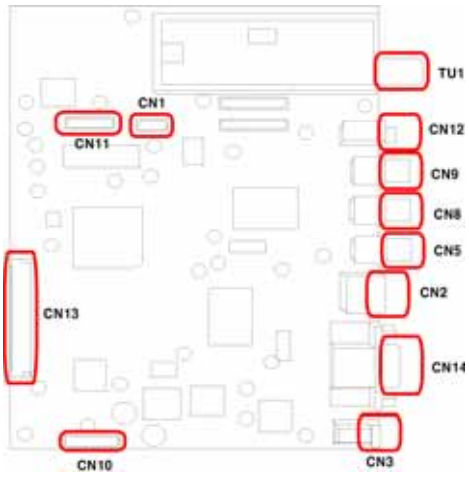
Connector	Location	Pin	Pin Name	Functional Description
CN 1 : Operation Button (Start/Stop, Intensity Up, Intensity Down)		1	GND	Ground
		2	GND	Ground
		3	START/STOP	Start/Stop Key
		4	UP	Level UP Key
		5	DOWN	Level Down Key
		6	ENTER	ENTER Key
		7	SCAN	Signal Scan
		8	VCC	VCC

4) Program Button Board



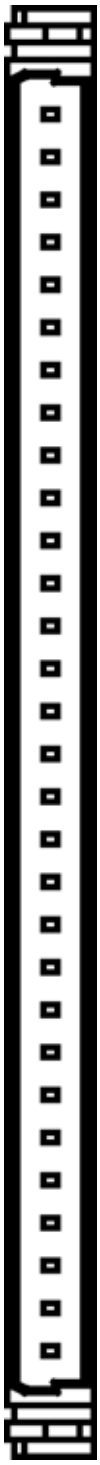
Connector	Location	Pin	Pin Name	Functional Description
CN 1 : Program Button		1	Q1	Data Output 1
		2	Q2	Data Output 2
		3	Q3	Data Output 3
		4	Q4	Data Output 4
		5	B4	Data In 4

5) A/D Board



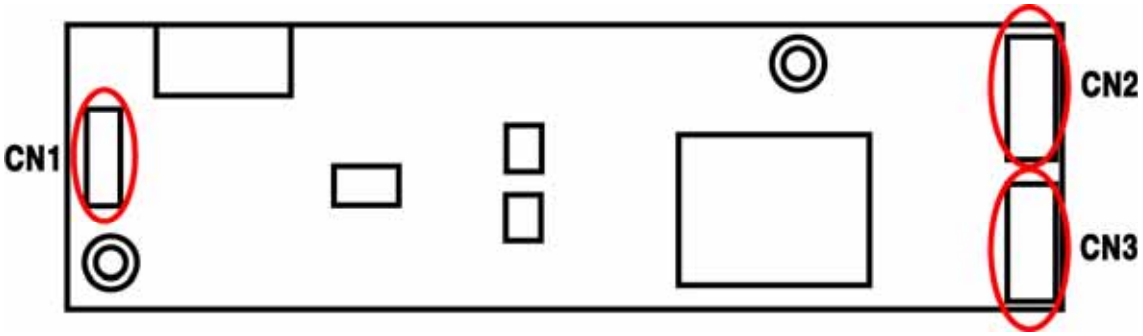
Connector	Location	Pin	Pin Name	Functional Description
CN 1 : Audio Out		1	Audio Left	Audio Left
		2	GND	Ground
		3	Audio Right	Audio Right
		4	GND	Ground
CN 2 : SVIDEO				S-VIDEO Input
CN 3 : DC In				DC 12V/3.5A Input
CN 5 : Video In				Video Input (Yellow)
CN 8 : Audio In				Audio Input (Red)
CN 9 : Audio In				Audio Input (White)

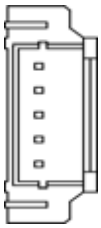
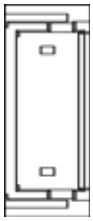
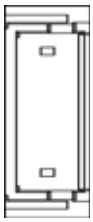
Connector	Location	Pin	Pin Name	Functional Description
CN 10 : LAMP Inverter Control		1	VCC	DC 12V/3.5A Vcc
		2	VCC	DC 12V/3.5A Vcc
		3	VCC	DC 12V/3.5A Vcc
		4	GND	Ground
		5	GND	Ground
		6	GND	Ground
		7	DIM CTRL	Back Light Intensity Adjust (DC 0 ~ 5V)
		8	On/Off	Back Light On/Off Control
CN 11 : OSD Key In		1	LED1	LDE Lamp
		2	KEY1	Key Input
		3	KEY2	Key Input
		4	5V	Vcc, DC 5V
		5	GND	Ground
		6	LED2	LED Lamp
		7	IR	IR Sensor
CN 12 : S-AUDIO In				S-AUDIO Input
CN 14 : RGB In				RGB Analog In (Monitor)
TU 1 : RF ANT In				RF ANT In

Connector	Location	Pin	Pin Name	Functional Description
CN 13 : LVDS Control CN 13 : LVDS Control		1	Vcc	Power for LCD panel
		2	Vcc	Power for LCD panel
		3	Vcc	Power for LCD panel
		4	NC	No Connection
		5	NC	No Connection
		6	NC	No Connection
		7	GND	Ground
		8	E 3+	LVDS EVEN
		9	E 3-	LVDS EVEN
		10	E CLK +	LVDS EVEN
		11	E CLK -	LVDS EVEN
		12	E 2+	LVDS EVEN
		13	E 2-	LVDS EVEN
		14	GND	Ground
		15	E 1+	LVDS EVEN
		16	E 1-	LVDS EVEN
		17	GND	Ground
		18	E 0+	LVDS EVEN
		19	E 0-	LVDS EVEN
		20	O 3+	LVDS ODD
		21	O 3-	LVDS ODD
		22	O CLK +	LVDS ODD
		23	O CLK -	LVDS ODD
		24	GND	Ground
		25	O 2+	LVDS ODD
		26	O 2-	LVDS ODD
		27	O 1+	LVDS ODD
		28	O 1-	LVDS ODD
		29	O 0+	LVDS ODD
		30	O 0-	LVDS ODD

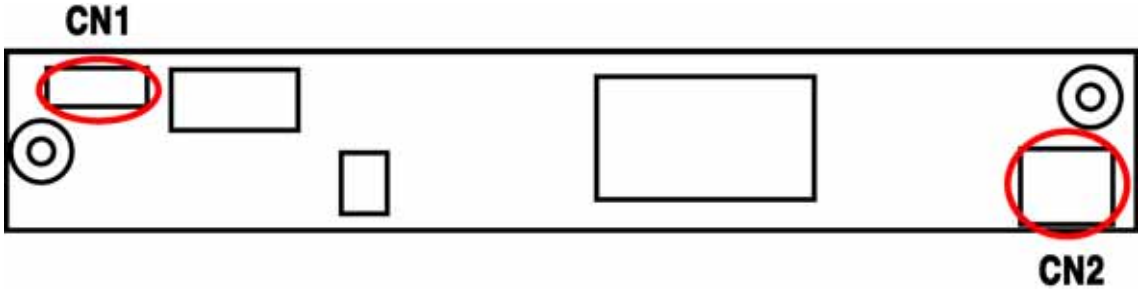
6) LAMP Inverter Board

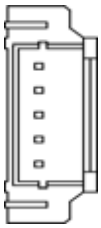
6-1) Lamp Inverter Board for two-lamp LCD screen



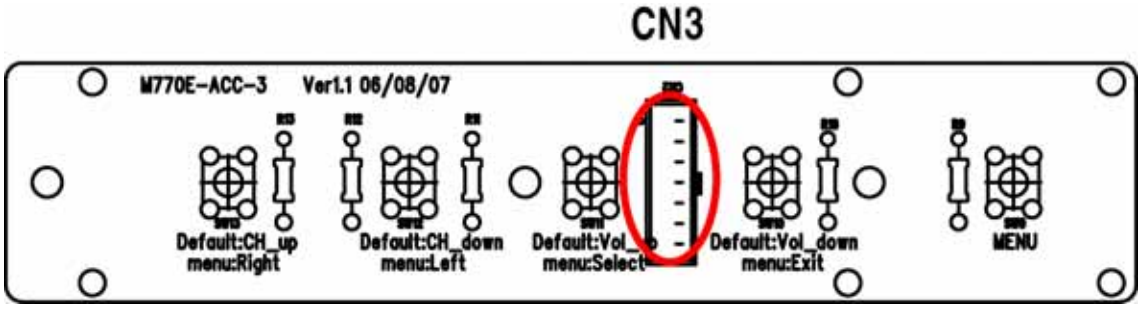
Connector	Location	Pin	Pin Name	Functional Description
CN 1 : Input Connector		1	VCC	DC 12V/3.5A Vcc
		2	GND	Ground
		3	On/Off	Back Light On/Off Control
		4	CTRL	Adjustment for Back Light Bright (DC 0 ~ 5V)
		5	GND	Ground
CN 2 : Output Connector 1		1	Lamp H1	High Voltage connection to high side of lamp
		2	Lamp L1	Low Voltage connection to low side of lamp
CN 3 : Output Connector 2		1	Lamp H2	High Voltage connection to high side of lamp
		2	Lamp L2	Low Voltage connection to low side of lamp

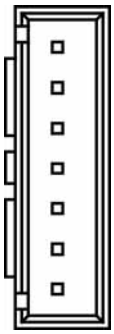
6-2) Lamp Inverter Board for one-lamp LCD screen



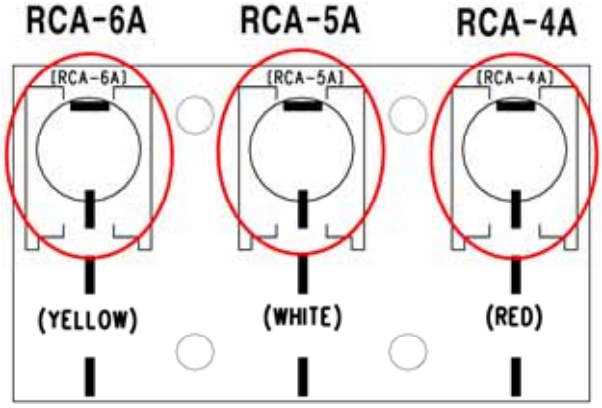
Connector	Location	Pin	Pin Name	Functional Description
CN 1 : Input Connector		1	GND	Ground
		2	CTRL	Adjustment for Back Light Bright (DC 0 ~ 5V)
		3	On/Off	Back Light On/Off Control
		4	VCC	DC 12V/3.5A Vcc
		5	GND	Ground
CN 2 : Output Connector 1		1	Lamp H1	High Voltage connection to high side of lamp
		2	Lamp L1	Low Voltage connection to low side of lamp

7) OSD Button Board



Connector	Location	Pin	Pin Name	Functional Description
CN 3 : OSD Button		1	NC	No Connection
		2	KEY1	Key 1 Output (Volume_up, Channel_down, Channel_up)
		3	KEY2	Key 2 Output (Volume_down, Power)
		4	5V	Vcc 5V
		5	GND	Ground
		6	NC	No Connection
		7	NC	No Connection

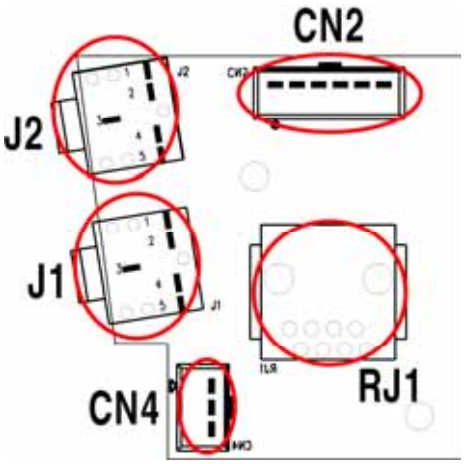
8) RCA Jack Board

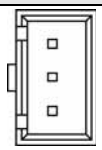
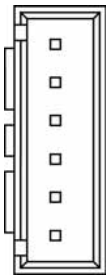
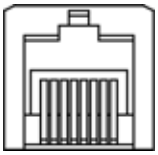


Connector	Location	Pin	Pin Name	Functional Description
RCA-4A :			RED	Audio Input
RCA-5A			WHITE	Audio Input

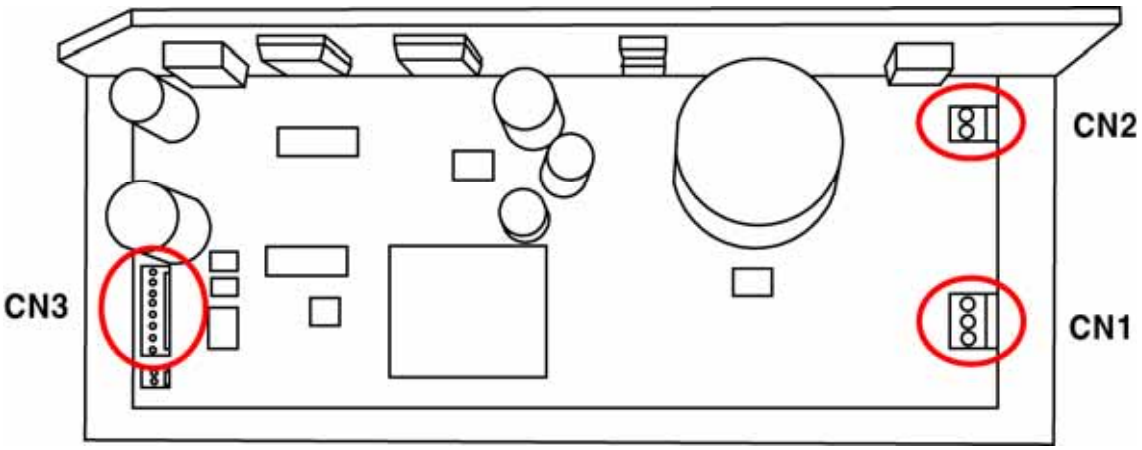
RCA-6A			YELLOW	Video Input

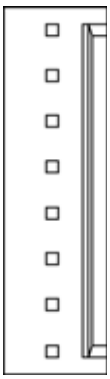
9) Audio Interface & Download Board



Connector	Location	Pin	Pin Name	Functional Description
CN 4 : Audio Interface		1	Audio_L	Stereo Left
		2	Audio_R	Stereo Right
		3	GND	Ground
CN 2 : Program Download		1	PD-Out	Program Data Output
		2	VCC	+5V
		3	SCK	Serial Clock
		4	PD-In	Program Data Input
		5	RESET	Receive data
		6	GND	Ground
RJ1 : Download Interface from External		1	PD-Out	Program Data Output
		2	VCC	+5V
		3	SCK	Serial Clock
		4	PD-In	Program Data Input
		5	RESET	Receive data
		6	GND	Ground
		7	GND	Ground
		8	NC	No Connection

10) Drive Board



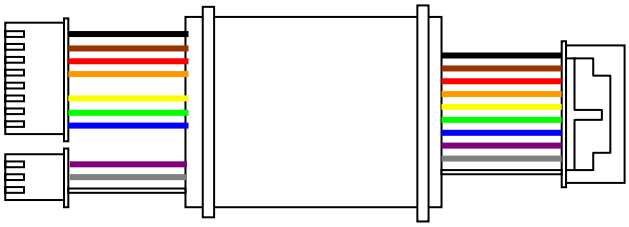
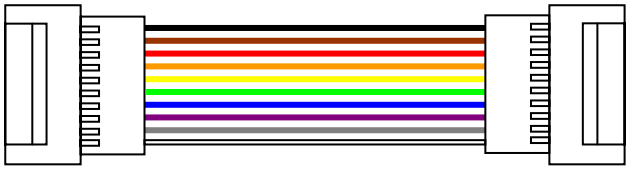
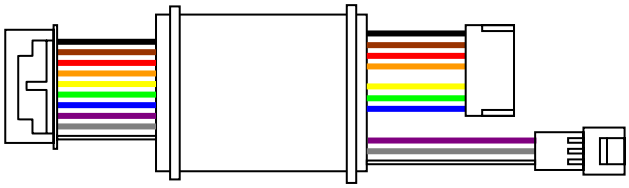
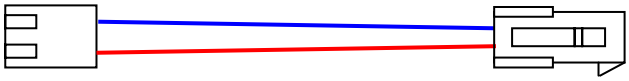
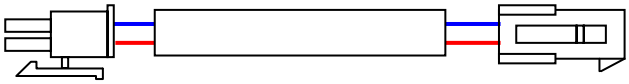
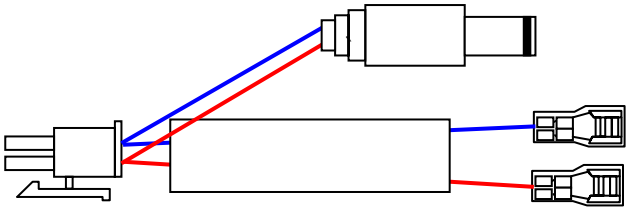
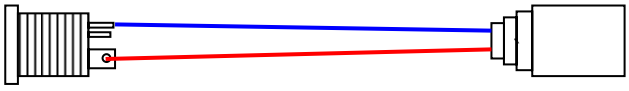
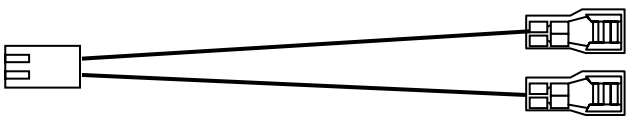
Connector	Location	Pin	Pin Name	Functional Description
CN 1 :		1	U-phase input	Voltage Source to Drive Board
		2	V-phase input	Voltage Source to Drive Board
		3	W-phase input	Voltage Source to Drive Board
CN 2 :		1	Brake Control	PWM Output for brake
		2	Brake Control	PWM Output for brake
CN 3 :		8	VCC	Voltage output
		7	GND	Ground
		6	E/P	Pulse for checking a rotation speed
		5	PWM	PWM Input for brake
		4	N.C	N.C
		3	VCC	Voltage output
		2	GND	Ground
		1	VCC	Voltage output

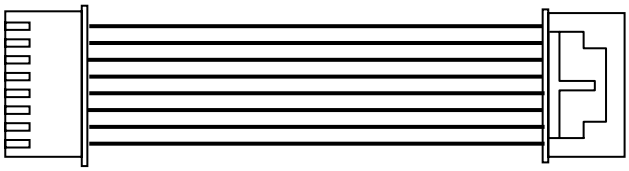
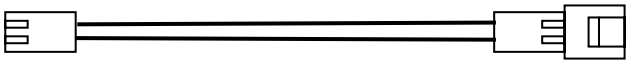
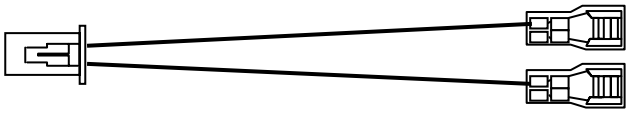
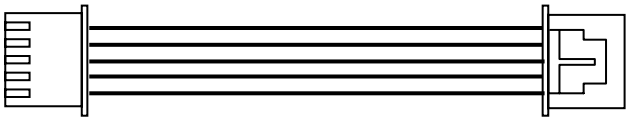
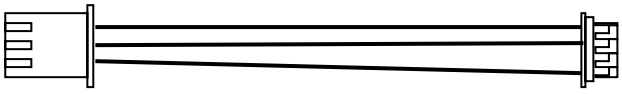
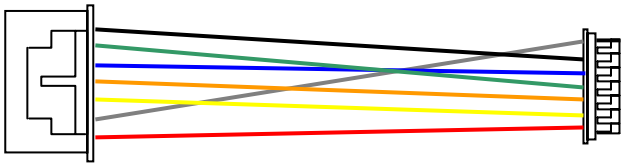
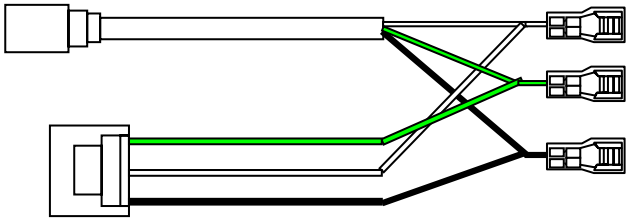
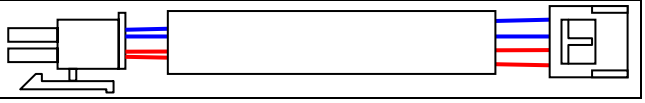
4.3 Cables & Connectors

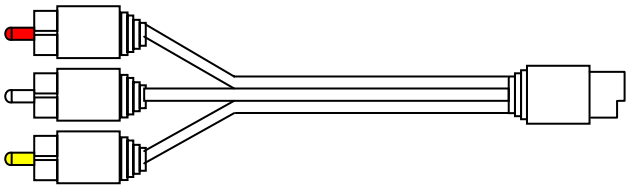
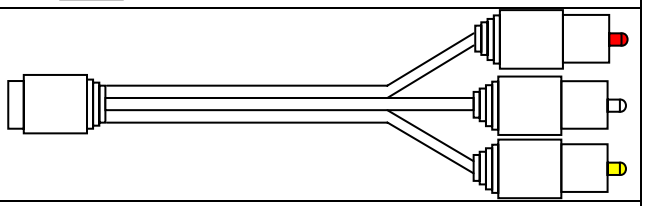
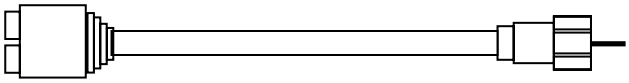
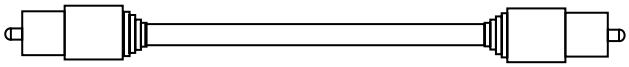
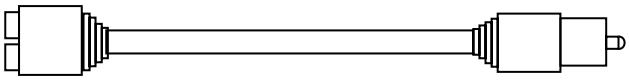
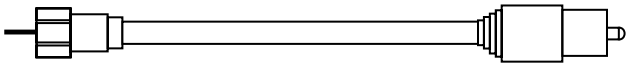
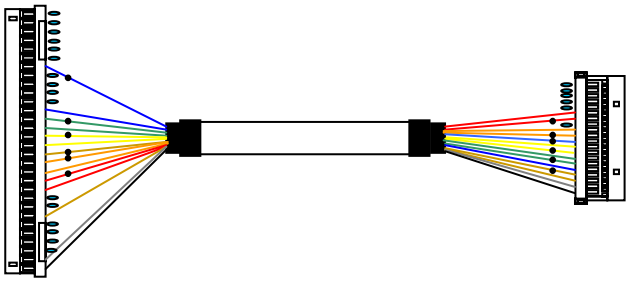
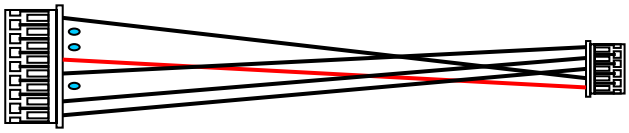
Cable No.	Start Board	Connec-tor No.	End Board	Connector No.	Wire	Length [mm]	Housing	Remark
CB1+CB2+CB3	Main (Dot)	CN1	Driver Board	CN3	8P	4640	SMH250-08	
CB4+CB5+CB6		CN3	Battery	-	2P	4540	CH1143-02	
CB8		CB5	Touch-L	-	2P	1300	SMH250-02	
CB9		CN8	Touch-R	-	2P	1300	YH025-02	
CB13+CB15		CN15	Touch-L (Move)	-	2P	1850	SMH250-02	
CB16+CB18		CN16	Touch-R (Move)	-	2P	1850	YH025-02	
CB12		CN12	Operation Board	CN1	8P	150	SMH250-08	
CB10		CN9	Download Module	CN2	6P	150	SMH250-06	
CB11		CN10	RF-HR(POLAR)	-	3P	900	SMH250-03	
-		CN11	Membrain	-	-			
CB1+CB2+CB3	Main (LCD)	CN1	Driver Board	CN3	8P	4640	SMH250-08	
CB8		CN4	Touch-L	-	2P	1300	SMH250-02	
CB9		CN8	Touch-R	-	2P	1300	YH025-02	
CB13+CB15		CN13	Touch-L (Move)	-	2P	1850	SMH250-02	
CB16+CB18		CN14	Touch-R (Move)	-	2P	1850	YH025-02	
CB10		CN9	Download Module	CN2	6P	150	SMH250-06	
CB12		CN12	Operation Board	CN1	8P	150	SMH250-08	
CB11		CN10	RF-HR(POLAR)	-	3P	900	SMH250-03	
CB19		CN16	Program Key	CN2	5P	300	SMH250-05	
CB4+CB5+CB23		CN15	5V SMPS	-	2P	3340	CH1143-02	
-		J1	MPU Display	J1	13P		Box Header	
-		J2	MPU Display	J2	12P		Box Header	
-		CN11	Membrain	-	-			
CB31	AD Board	CN13	LCD Panel	-	14P	250		
CB32		CN10	LAMP Inverter	-	5P	160		
CB21		CN1	OSD Board	CN3	7P	200		
CB20		CN11	Audio Jack Board	CN4	3P	350		

Cable No.	Start Board	Connector No.	End Board	Connector No.	Wire	Length [mm]	Housing	Remark
CB24+CB24	Adaptor	-	AD Board	CN3		2200		
CB25+CB28	Terminal Plate	-	AD Board	CN5		2300		Yellow
CB25+CB28		-		CN8		2300		Red
CB25+CB28		-		CN9		2300		White
CB26-2+CB29	Terminal Plate	-	AD Board	TU1		2210		NTSC
CB26-1+CB30		-		TU1		2210		PAL/ SECAM
CB22	Power S/W	-	Adaptor	-	-	740		
			SMPS + 5V	-	-	830	YH396-05V	
CB7	Plate	-	Batter Cable (Bottom)			100		
-	Drive Board	CN1	Genurator	-	3P			
-		CN2		-	2P			

4.4 Cable Diagram

Cable No.	Cable Name	Cable Spec
CB1	Main Cable (Top)	
CB2	Main Cable (Middle)	
CB3	Main Cable(Bottom)	
CB4	Battery Cable(Top)	
CB5	Battery Cable(Middle)	
CB6	Battery Cable(Bottom)	
CB7	Adaoter Cable	
CB8	Touch HR Left Cable	
CB9	Touch HR Right Cable	
CB10	DownLoad Cable	

Cable No.	Cable Name	Cable Spec
CB11	POLAR Cable	
CB12	Tact Switch (Operation) Cable	
CB13	Moving Handle Touch HR Left Cable (Top)	
CB15	Moving Handle Touch HR Left Cable	
CB16	Moving Handle Touch HR Right Cable(Top)	
CB18	Moving Handle Touch HR Right Cable	
CB19	Program Key Cable	
CB20	Audio out Cable	
CB21	OSD Cable	
CB22	Power Cable	
CB23	SMPS +5V (Bottom)	

Cable No.	Cable Name	Cable Spec
CB24	SMPS 12V Cable (TOP)	
CB25	RCA Cable (Bottom)	
CB28	RCA Cable (TOP)	
CB29	Coaxial Cable (NTSC-TOP)	
CB26-2	Coaxial Cable (NTSC-Bottom)	
CB30	Coaxial Cable (PAL/SECAM-TOP)	
CB26-1	Coaxial Cable (PAL/SECAM-Bottom)	
CB31	LVDS Cable	
CB32	LAMP Inverter Cable	

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